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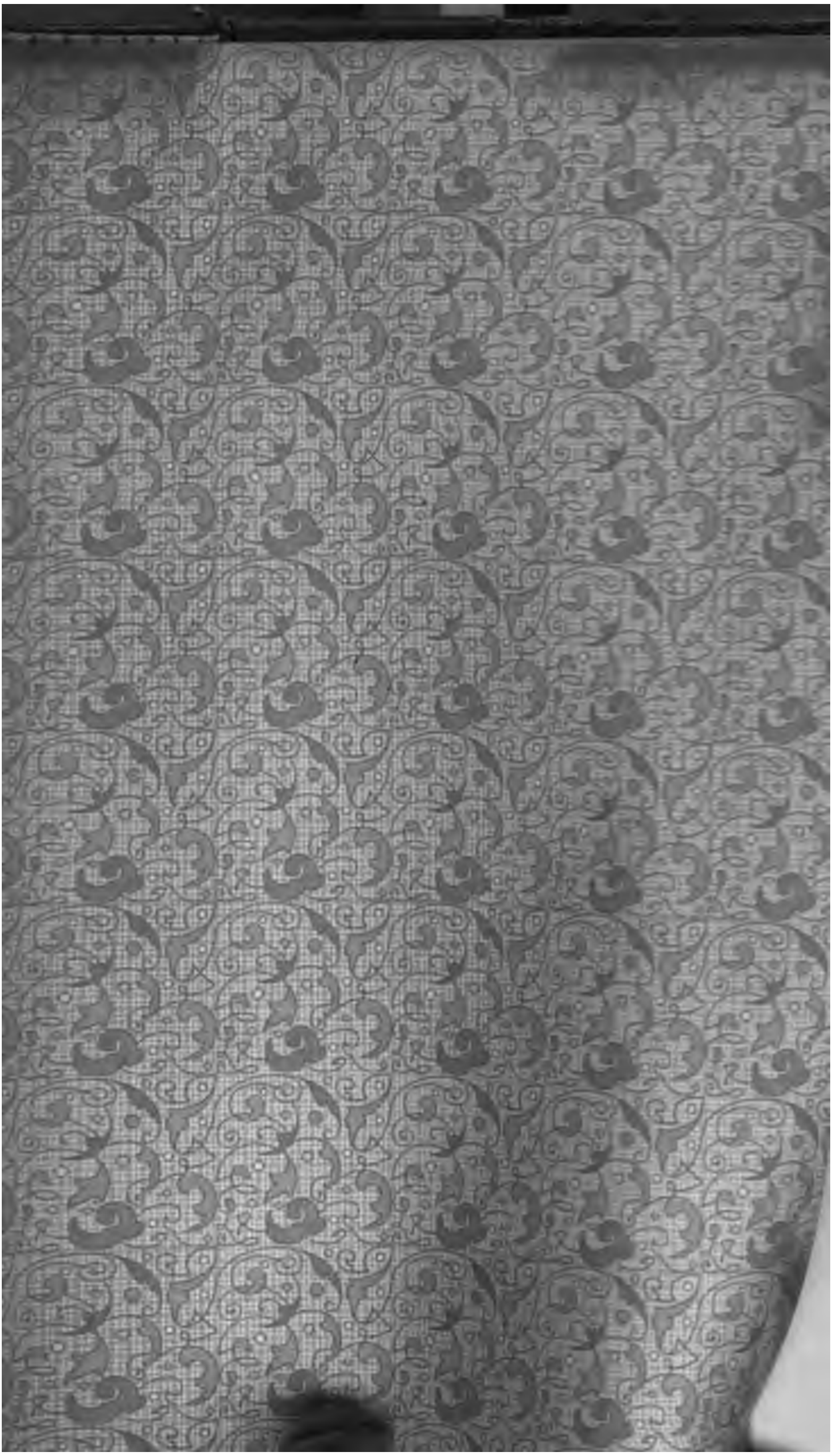

REVIEW

—OF—

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VOL. X. 1904.

WILLIAM A. NOYES, Editor.

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REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. X. NO. 1.

WILLIAM A. NOYES, Editor.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

On Artificial Production of Crystallized Domeykite, Algodonite, Argentodomeykite and Stibiodomeykite. BY GEORGE A. KÖNIG. *Proc. Am. Phil. Soc.*, 42, 219–237; figures.—By exposing various metals and alloys to the vapors of arsenic in a glass tube suitably arranged and electrically heated by a surrounding spiral of platinum wire, artificial forms of the above-named and other minerals have been produced. The author's main object was, however, not so much the production of crystals as to demonstrate the isomorphous replaceability of copper by nickel and cobalt in the domeykite molecule, with the formation of mohawkite. The best and most instructive results were obtained with the metal in the form of small bars or thick wire, and not as powder. In the case of domeykite—Cu_3As—crystals up to 4 or 5 mm. diameter were formed, but such sizes were exceptional. Their mode of attachment to and remarkable growth upon the copper, leads to most interesting speculations upon the "ionic mobility" of the copper molecules, for the arsenic does not ordinarily penetrate the copper, as does carbon iron in the cementation process for steel, but the copper passes out through the already formed and forming crystals to take part in the growth of new ones. When alloys of copper with other metals were exposed to arsenic vapors, portions of these other metals entered into the crystals formed, but in far less degree than their proportions in the alloys would have indicated, thus showing not only a lesser ionic mobility but also that the movement seemed to be directed by that of the copper, since when alone no sprouting crystals formed, but the behavior was like that of iron toward carbon. The points of formation and of fusion of these crystals being near together, somewhat careful regulation of the temperature is necessary. For domeykite a temperature of about 600° C. was found to be the most favorable, though the range employed in the experiments was from about 450° to 700°. Details of numerous experiments are given and also the analyses of the various products. Zinc and lead were also shown to absorb arsenic vapor, the former much more readily than the latter.

Following this paper is one (pp. 237–249 ; plates, figures) by Fred Eugene Wright on the crystallographic properties of Dr. König's various artificial arsenides. Only the domeykite crystals permitted of good determinations. The whole group "is characterized by high metallic luster, tin white to steel gray and even black color, conchoidal fracture, and hardness 3–4." Both angle measurements and etch figures seem to prove the hexagonal nature of the domeykite crystals, notwithstanding the objection of Stevanovics (Zeit. Kryst., **37**, 245), but for argentodomeykite, stibiodomeykite, and mohawkite the evidence of hexagonal crystallization rests on goniometric measurements only. W. F. HILLEBRAND.

The Vermilion Iron-bearing District of Minnesota, with an Atlas. BY J. MORGAN CLEMENTS. *U. S. Geol. Survey Monograph*, **45**, 463 pp.; numerous plates and figures.—There is no new chemical matter in this report, nor are new ideas advanced to account for the origin of the ores. The views of Van Hise (this Journal, **24**, R. 147,) as to the chemical processes resulting in the concentration of such deposits as occur about Lake Superior are held to sufficiently explain the present occurrences. (See also this Journal, **25**, R. 213). W. F. HILLEBRAND.

Fossiliferous Rocks of Southwest Ontario. BY W. A. PARKS. *Rep. Ontario Bureau of Mines, 1903*, pp. 141–156.—Contains analyses of limestones, of a slate, a bituminous shale, and a gypsum. W. F. HILLEBRAND.

The Sudbury Nickel Deposits. BY A. P. COLEMAN. *Rep. Ontario Bureau of Mines, 1903*, pp. 245–303; plates, figures.—A very thorough study of the geology of these important deposits. The author is inclined to accept as most probable the gravitational theory to account for the segregation of these great masses of sulphides from the igneous rock of whose composition they at one time partook. (See also this Journal, **25**, R. 436.) W. F. HILLEBRAND.

Iron Ranges in Northern Ontario. BY WILLET G. MILLER. *Rep. Ontario Bureau of Mines, 1903*, pp. 304–317; figures.—Three or four analyses of limestones and hematites appear in this report. W. F. HILLEBRAND.

Moose Mountain Iron Range. BY C. K. LEITH. *Rep. Ontario Bureau of Mines, 1903*, pp. 318–321; figures.—The geological features are briefly considered and compared with those of the Vermilion range, as also the possible origin of the ore. (See Clements, cited above.) W. F. HILLEBRAND.

Magnetic Concentration of Iron Ores. BY J. WALTER WELLS. *Rep. Ontario Bureau of Mines, 1903,* pp. 322–342; plates.—The paper concludes with a review of the bibliography of the subject. W. F. HILLEBRAND.

Notes on the Geology of Southwestern Idaho and Southeastern Oregon. BY ISRAEL C. RUSSELL. *U. S. Geol. Survey Bull. No. 217,* 83 pp.; map, plates, figures.—In this reconnaissance report appears an analysis of the water from Harney Lake, Oregon, and of a surface efflorescence from the neighborhood of Narrows, Oregon, both by George Steiger, of the Survey laboratory. The author has taken several liberties with the analyses and is responsible for the incorrect naming of some of the components. The analyses as originally reported are, in somewhat rearranged form and without the proximate composition of the incrustation, as given below. Fe, Al, Br, and I were not found in the water.

Water of Harney Lake, parts per million.	
SiO_2	28.7
Mg	6.8
Na	3604.5
K	192.8
CO_3	2974.7
H (bicarbonate)	32.3
SO_4	773.3
Cl	2771.3
B_4O_7	92.8
	10477.2

Spec. gravity, 1.081

Incrustation.	
Insol. in water	1.25
Na_2O	47.49
H_2O	10.08
SO_3	11.76
Cl	3.75
CO_2	26.33
B_2O_3	0.28
	100.94
Less O for Cl	0.85
	100.09

W. F. HILLEBRAND.

Mineralogical Notes. BY C. H. WARREN. *Am. J. Sci.*, 16, 337–344; figures. *Native Arsenic.*—Found in the usual reniform masses, sometimes weighing several pounds each, at Washington Camp, Santa Cruz County, Arizona, attached to the sides of a pocket in dolomitic limestone. A small amount of antimony is found in the arsenic and a trace of sulphur. Fumarolic action is supposed to have given rise to the deposit. *Anthophyllite.*—The ferrous metasilicate corresponding to anthophyllite is found in the quarries of the Rockport Granite Company at Rockport, Massachusetts, where it appears to have developed from fayalite by taking up silica from the enclosing pegmatite. The mineral occurs in radial fibrous aggregates, the fibers being translucent, and white to light brown. Every stage of the alteration of the fayalite is exhibited. *A strontium-bearing cerussite* occurs in the Terrible mine, Isle, Custer County, Colorado, with 4.48 per cent. of strontium carbonate. Specific gravity, 6.409. Associated with it is the lead chlorocarbonate, phosgenite, which was found to contain no strontium. W. F. HILLEBRAND.

Note on the Identity of Palacheite and Botryogen. BY ARTHUR S. EAKLE. *Am. J. Sci.*, **16**, 379–380. The name palacheite (this Journal, **25**, R. 302) is withdrawn, since the mineral to which that name was given is in reality botryogen, though a purer form than any hitherto met with. Additional data are given. W. F. HILLEBRAND.

Californite (Vesuvianite)—A New Ornamental Stone. BY GEORGE F. KUNZ. *Am. J. Sci.*, **16**, 397.—The following analysis, by George Steiger, is that of an ornamental stone resembling jade (nephrite) in appearance, but having the composition of the mineral vesuvianite: SiO_2, 35.85; Al_2O_3, 18.35; CaO, 33.51; Fe_2O_3, 1.67; FeO, 0.39; MgO, 5.43; MnO, 0.05; TiO_2, 0.10; P_2O_5, 0.02; H_2O, below 100, 0.29; H_2O above 100, 4.18; total, 99.85. Hardness, 6.5. Specific gravity, 3.286. The stone occurs on the South Fork of Indian Creek, in Siskiyou County, California, where it outcrops for a distance of 200 feet. What appears to be the same mineral is announced from two other California localities, Buena Valley, Fresno County, and in Tulare County, near the town of Selma. It is unfortunate that the author has seen fit to burden the nomenclature with an unnecessary name, all the more so as the most recent unpublished work has shown that it covers two distinct mineral species. W. F. HILLEBRAND.

Native Bismuth and Bismite from Pala, California. BY GEORGE F. KUNZ. *Am. J. Sci.*, **16**, 398.—These minerals are to be added to the others known from this locality famous for its lithia minerals. They occur in a coarse granite capping a large mass of amblygonite. The bismuth is generally in long irregular crystals, of which one was evidently a pseudomorph after feldspar(?). W. F. HILLEBRAND.

Spodumene from San Diego County, California. BY WALDEMAR T. SCHALLER. *Univ. of California, Bull. Dept. of Geol.*, Vol. 3, pp. 265–275; plates.—The gem mineral kunzite is here more fully described as to its crystallography and occurrence at Pala than in the papers of Mr. Kunz (abstract this Journal, **25**, R. 506). It is found in a portion of a pegmatite dike, the rock of which is ordinarily a coarse muscovite granite, containing black tourmaline. The muscovite is sometimes seemingly replaced by lepidolite, and then the place of the black tourmaline is taken by red, blue, and green varieties. With these last, the spodumene occurs. Since it is found in pockets, and for othe reasons, it is supposed to be of later formation than the tourmalines and the dike itself. Less than a mile distant is a similar pegmatite dike carrying the magnificent lepidolites and rubellites which first directed attention to this locality, but spodumene has not yet been found with these. The rock enclosing the dikes is, probably in both cases, a basic diorite composed of hornblende, plagioclase, some orthoclase, with accessory magnetite and apatite. The crystallography of the mineral is fully detailed. An analysis, agreeing closely with that by Penfield of the pink spodumene from Branchville, Connecticut, gave : SiO_2, 64.42; Al_2O_3, 27.32; Mn_2O_3, 0.15; Li_2O, 7.20; Na_2O, 0.39; K_2O, 0.03; Total, 99.51. No loss on ignition, Fe_2O_3, CaO, MgO absent. Spec. gravity, 3.189. W. F. HILLEBRAND.

Nebraska Geological Survey, Vol. 1. Report of the State Geologist, Erwin H. Barbour. 258 pp.; numerous maps, plates, and figures.—This untechnical report contains a few analyses, of which some, relating to coal and lignite, appear to be new. The physiography, geology, and mineral resources of the state are discussed. W. F. HILLEBRAND.

Relation of Rock Segregation to Ore Deposition. BY BLAMEY STEVENS. *Eng. and Min. J.*, **76**, 574.—The author presents the following illustration of his views of the cause of the more general igneous segregations, as distinguished from more special cases. "When magmas first begin to crystallize, the small crystals remain in suspension in the magma and flow with it in any direction, since the magma is apparently too viscous or too full of convection currents to allow the crystals to settle or flocculate unless they are of large size and density. As crystallization proceeds, however, a stage is reached when the magma becomes plastic and no longer obeys the laws of a liquid. The interstices will then contain something under 50 per cent. of fluid, and as long as the stresses of the mass of plastoid are all of a fluid or normal character, no segregation will take place; but lateral or shearing stresses, if sufficiently great, will tend to induce a redistribution of the fluid, and in cases of shearing strain carried beyond the rupture limits—which will not be high—segregation will take place along lines of fracture. The segregated quartz veins or lenses of many gneisses and schists may thus be explained without any theory based on water-carried material." "While I consider this plastic metamorphism will be found to accompany and to be an indication of the regions of quartz or aplitic segregations, I also believe that they form only preliminary concentrations of the precious metals, which in their virgin form will never be worked for the precious metals. . . . " W. F. HILLEBRAND.

A New Spheroidal Granite. BY J. F. KEMP. *Science*, **18**, 503–504. Near Charlevoix, in northwestern Lower Michigan, was found a glacial boulder of large size which furnished an interesting addition to the examples of spheroidal structure in rocks of deep-seated origin. W. F. HILLEBRAND.

ANALYTICAL CHEMISTRY.

The Use of Sodium Peroxide and Cupels of Portland Cement in Gold and Silver Assaying. *Rep. Ontario Bureau of Mines, 1903*, p. 71.—Messrs. Wells and Burrows, in reporting the work of the Provincial Assay Office, mention two improvements which save the assayer considerable trouble. "Sodium peroxide is used to oxidize sulphide and arsenical ores, replacing sodium nitrate, which has many objectionable qualities for this purpose, and also doing away with the slow and troublesome method of roasting sulphides in a muffle furnace. Sodium peroxide together with iron nails, will eliminate the sulphur from a pure pyrite ore carrying 50 per cent. sulphur, and the loss of gold and silver is no greater than with nitre or roasting. No argols or other reducing agent is required. Cupels made of Portland cement have been found by practice to be as satisfactory as bone ash for the elimination of zinc, lead, arsenic, etc., from gold and silver!" The cupels are hard and durable, and cost next to nothing. W. F. HILLEBRAND.

The Determination of Uranium and Uranyl Phosphate by the Zinc Reductor. BY O. S. PULMAN, JR. *Am. J. Sci.*, **16**, 229–239.—The following method for determining uranium is proposed by the author as a substitute for a method given by Kern (This Journal, **23**, 716). Heat a solution of uranium sulphate, ranging from 100 to 150 cc. in volume and containing a proportion of free sulphuric acid varying between the limits of 1 to 5 and 1 to 7, nearly to boiling, and preceding it with a small quantity of the same strength acid, pass it slowly through a long Jones reductor, using gentle suction. Rinse the flask with sulphuric acid of the same strength, and, after passing this through the reductor, follow with 250 cc. of hot water. Pour the contents of the receiving flask into a porcelain dish, dilute with about 200 cc. of hot water and titrate with standard permanganate solution. When 0.3 gram of uranic oxide is used, the reduction and washing require at least half an hour. On exposure to the air, the color of the reduced solution changes immediately from an olive-green to the sea-green color always possessed by uranous salts. Reduction to a stage of oxidation below that represented by UO_2 was proved by a series of determinations in which reduction and titration were carried on in an atmosphere of carbon dioxide and which gave very high positive results in every case.

To determine phosphoric acid by precipitating as ammonium uranyl phosphate and titrating the uranium in the precipitate, proceed as follows: To the hot solution containing the phosphate, 12 grams of ammonium acetate and 2 to 4 cc. of free acetic acid, add an excess of uranium nitrate, with stirring, and after boiling gently for about twenty minutes allow to settle, and filter on a tight felt of asbestos. After washing the beaker and precipitate thoroughly with a dilute solution of ammonium acetate containing a small amount of dilute acetic acid, dissolve the precipitate in dilute sulphuric acid (1 to 6), allowing the solution to run into the beaker that was used for the precipitation. Make the solution up to 100–150 cc. with dilute sulphuric acid, heat to boiling, pass through the reductor, and titrate with permanganate.

An asbestos felt of the usual thickness, covered with a layer of the finely divided particles of asbestos that remain suspended in the liquid after the coarser fibers have settled, will retain all the precipitate. B. S. CUSHMAN.

ORGANIC CHEMISTRY.

Esters of Sulphuric Acid and of Chlorsulphonic Acid. BY F. W. BUSHONG. *Am. Chem. J.*, **30**, 212–224; *Trans. Kansas Acad. Sci.*, **18**, (1903) 1–6.—*Chlorsulphonic Ethyl Ester*, $ClSO_2OC_2H_5$, is best prepared by the interaction of sulphuryl chloride and absolute alcohol at low temperatures. When pure, it is a colorless limpid liquid, b. p. 52° at 14 mm., 58° at 20 mm., specific gravity 1.263 at 18°. It is soluble in ligroin, chloroform and ether, but it attacks the ether when warmed. It dissolves in fuming nitric acid, and separates unchanged upon dilution. It is but slightly attacked by cold water. I. *The Action of Chlorsulphonic Ethyl Ester on Sodium Alcoholates* in ligroin or ethereal solution leads to the formation of five reaction-products: (1) alkyl ethyl sulphate, (2) alkyl sodium sulphate, (3) a mixed ether, (4) sodium sulphate, and (5) alcohol. *Chlorsulphonic Ethyl Ester and Sodium Ethylate.*—25 grams of the ethylate with 25 grams of the chlor ester yielded 2.85 grams of ethyl ether, 9.92 grams diethyl sulphate, 12.2 grams sodium ethyl sulphate, and 1.25 grams sodium sulphate. *Ethyl Isoamyl Sulphate*, $C_2H_5OSO_2OC_5H_{11}$, from chlorsulphonic ethyl ester and sodium isoamylate, is a colorless oil, b. p. 127°–128° at 15 mm., sp. gr. 1.079 at 20°. *Ethyl Isobutyl Sulphate* is a colorless oil, which boils at 108° at 13 mm., and has a sp. gr. of 1.098 at 23°. *Ethyl Isopropyl Sulphate* boils at 105° at 18 mm. and has a sp.gr. of 1.143 at 21°.—II. *The Action of Sulphuryl Chloride on Sodium Alcoholates.*—The products are dialkyl sulphate, alkyl sodium sulphate, sodium sulphate and sulphite. *Diethyl Sulphate*, b. p. 96°–98° at 15 mm. *Diisoamyl Sulphate*, b. p. 149°–151° at 12 mm. *Diisobutyl Sulphate*, sp. gr. at 23°, 1.042; refractive index for sodium light, 1.415. *Diisopropyl Sulphate* is very unstable, decomposing on standing at ordinary temperatures.—III. *The Action of Ethyl Chlorsulphonate upon Aniline.*—In addition to sulphanilic acid, which has already been reported as the main product of this reaction, the author has also observed the formation of much ethylaniline. The experiments show that ethyl chlorsulphonate is an alkylating agent, its action being similar to that of alkyl halides, nitrates, etc.

M. T. BOGERT.

The Action of Carbon Monoxide on Sodium Alcoholates Alone and in the Presence of Salts of Fatty Acids. BY W. A. BEATTY. *Am. Chem. J.*, 30, 224–244.—*Sodium Isoamylate and* CO.—450 grams of sodium isoamylate, heated at 180°–190° for twelve days in an atmosphere of CO, yielded 25 grams isopropyl isoamyl ethyl alcohol (decyl alcohol), 14 grams of 1-isobutyl-2-isopropylbutyrolactone (γ-oxyundecylenic acid lactone), 25 grams isopropylisoamylacetic acid, much formic and isovaleric acids, and some amyl alcohol. *Sodium Isoamylate, Sodium Acetate and* CO.—If equal molecules of dry sodium isoamylate and fused sodium acetate are intimately mixed in a mortar, and CO passed over the mixture at 150°–200°, the sodium acetate is unaffected, and the same products are obtained as when sodium isoamylate alone is used. *Oxidation of Undecylenic Acid Lactone.*—By oxidation of the free hydroxy acid from the lactone, α- or *trans-isopropylisobutylsuccinic Acid*, $(CH_3)_2CH.CH(COOH).CH(COOH)CH_2.CH(CH_3)_2$, is obtained, and can be crystallized from water in long needles, m. p. 142°. *Synthesis of β- or cis-Isopropylisobutylsuccinic Acid.*—This was accomplished in two ways: (1) Isopropylisobutylethanetricarboxylate was prepared from sodium isobutylmalonic ester and α-bromisovaleric ester, the tricarboxylate by saponification and loss of CO_2 giving the desired acid; (2) from α-bromisobutylacetic ester and sodiomalonic ester, isobutylethanetricarboxylate was obtained, whose sodium derivative treated with isopropyl iodide gave an isopropylisobutylethanetricarboxylate isomeric with that produced in the preceding method, and from which the isopropylisobutylsuccinic acid was secured in the same way. The pure acid forms white crystals, m. p. 118°–119°, and gives insoluble calcium and silver salts. The *Amic Acid* forms fine silky needles, m. p. 145°-146°; *Anilic Acid*, needles (from alcohol), m. p. 149°–150°; *p-Tolilic Acid*, m. p. 156°–157°. *Sodium Ethylate and Sodium Acetate Heated Alone and in the Presence of* CO. An intimate mixture of equal molecules of sodium ethylate and acetate heated four days at 180°–200°, in an atmosphere of CO, gave formic, acetic and butyric acids, a solid acid, and a neutral oil. The same materials heated together in absence of CO, gave butyric acid and an acid boiling at 165°-195°, but no solid acid or neutral products. On mixing alcoholic solutions of potassium acetate and sodium ethylate, a voluminous precipitate immediately separates in the cold. It is probably the ortho addition-product, $CH_3(OK)C(ONa)(OC_2H_5)$. *The Dissociation of Sodium Methylate.*—Pure and dry sodium methylate, when heated at 260°–400°, gives off a gas which is a mixture of methane and hydrogen, while the charred residue contains sodium acetylide, Na_2C_2.

M. T. BOGERT.

Further Investigations on the Two Isomeric Chlorides of Orthosulphobenzoic Acid. BY IRA REMSEN. *Am. Chem. J.*, 30, 247–309. INTRODUCTORY (By Ira Remsen).—A review is given of the reactions which lead to the conclusion that the lower melting chloride possesses the unsymmetrical, the higher melting one the symmetrical structure. These reactions include the behavior of the two chlorides with water, ammonia, aniline and other amines, alcohols, phenols, benzene and aluminum chloride, and nascent hydrogen. EXPERIMENTAL.—*I. The Action of Ammonia and of Alcohols and Alcoholates upon the Chlorides of Orthosulphobenzoic Acid* (By R. M. Bird).—With very dilute aqueous ammonia, the low-melting chloride gives only ammonium *o*-cyanbenzenesulphonate with a faint trace of ammonium benzoic sulphinide; with moderately strong (1 : 3) aqueous ammonia, or with the ordinary concentrated article, much more of the chloride is changed to the sulphinide (up to 20.2 per cent). When dry ammonia gas is used, only the ammonium cyanbenzenesulphonate is produced. With the higher melting (symmetrical) chloride, ammonia, either dry or in aqueous solution, gives only the ammonium sulphinide, as already reported in previous papers. *Ammonium o-Carbaminebenzenesulphonate*, $H_2N.CO.C_6H_4.SO_3NH_4$, obtained by partial hydrolysis of the cyansulpho acid, crystallizes in white needles and large thick crystals, the latter changing to the needles on recrystallization. It melts at 256°–257°. *Potassium o-Cyanbenzenesulphonate* is difficultly soluble in potassium carbonate solution and crystallizes from water in thick transparent needles. *Action of Alcohols and Alcoholates.*—It has been shown already that the two chlorides react with alcohols to form ester chlorides first, which by further action of the alcohols pass over into the corresponding ester acids. *Sodium o-Sulphonate of Ethyl Benzoate*, $NaOSO_2.C_6H_4COOC_2H_5$, from the symmetrical chloride and sodium ethylate, or from the *o*-sulphone chloride of ethyl benzoate with sodium ethylate, forms transparent colorless crystals. *Silver o-Sulphonate of Methyl Benzoate*, and the corresponding *barium* and *sodium salts* were prepared. The crystals of the barium salt carry one molecule of water; those of the sodium salt two. The latter was obtained from the unsymmetrical chloride, sodium methylate and methyl alcohol. *Neutral Sodium o-Sulphobenzoate*, $NaOSO_2C_6H_4CO_2Na$; transparent colorless needles. *II. Action of Aniline upon the Chlorides of o-Sulphobenzoic Acid* (By W. B. Holmes).—An emulsion of aniline in cold water gives, with the high-melting chloride, the symmetrical anilide and the anil, the low-melting chloride, under the same conditions, giving both the symmetrical and the unsymmetrical anilides; the latter is the main product. By varying the conditions, all three products can be obtained from either chloride. *III. The Action of Aliphatic Amines on the Chlorides of o-Sulphobenzoic Acid* (By Friend E. Clark).—With methyl and ethyl amine, the symmetrical chloride gives the corresponding esters of benzoic sulphinide, while the unsymmetrical chloride yields mainly unsymmetrical substituted diamides with but small amounts of the sulphinide esters. With dimethylamine, the high-melting chloride gives a symmetrical product, and the same body can be obtained from the unsymmetrical chloride. Methyl benzoic sulphinide can be hydrolyzed by hydrochloric acid to the acid methylammonium salt of *o*-sulphobenzoic acid. *Potassium o-Methylsulphaminebenzoate* crystallizes from alcohol in small plates, very soluble in water or alcohol, insoluble in petroleum ether. The corresponding *barium salt* was also prepared. *o-Toluenesulphone Methylamide*, from the sulphone chloride and methylamine, forms colorless needles or plates, m. p. 74°–75°. It can be oxidized to *o-methylsulphaminebenzoic Acid* by alkaline permanganate. The acid has no constant m. p., as it tends to pass into the methyl sulphinide. *o-Sulphobenzoic Dimethylamide*, $CH_3NHSO_2C_6H_4CONHCH_3$; needles, m. p. 74°. *Unsymmetrical Dimethylamide of o-Sulphobenzoic Acid*, $(CH_3NH)_2{:}\underbrace{C.C_6H_4SO_2O}$; plates, decomposing above 330° without melting. *o-Ethylsulphaminebenzoic Acid*, $C_2H_5NHSO_2C_6H_4COOH$, prepared by hydrolysis of the ethyl sulphinide, forms a neutral *potassium salt*, which crystallizes from water in very small plates, containing $2H_2O$. The *barium salt* was likewise prepared. *Ethylammonium Salt of o-Sulphobenzoic Acid* crystallizes from water in delicate needles. *Infusible* (*Unsymmetrical*) *Diethylamide of o-Sulphobenzoic Acid* crystallizes in rhombic prisms, insoluble in water but soluble in alcohol. *Symmetrical Tetramethyldiamide of o-Sulphobenzoic Acid*, from the symmetrical chloride and dimethylamine, crystallizes well from alcohol. The crystals are figured and crystallographic measurements given (by E. B. Matthews and A. Johannsen). *IV. The Action of Phenol on the Chlorides of Orthosulphobenzoic Acid* (By Robert E. Humphreys).—The two chlorides give the same products with phenol and with resorcinol; in the former case, the phenyl ester chloride and the diphenyl ester, in the latter sulphonfluoresceïn. By the simultaneous action of phenol and ammonia upon the symmetrical chloride, phenyl *o*-sulphaminebenzoate and the diphenyl ester of *o*-sulphobenzoic acid are obtained, while the unsymmetrical chloride is converted partly into the diphenyl ester and partly into ammonium *o*-cyanbenzenesulphonate, no sulphamine body being formed. The action of ammonia alone upon the *o*-sulphone chloride of phenyl benzoate does not give any of the sulphamine. *Phenyl o-Sulphaminebenzoate*, $NH_2SO_2C_6H_4COOC_6H_5$, forms triclinic crystals, m. p. 132°. Dilute KOH or dilute ammonia change it to the sulphinide. *o-Cresyl o-Sulphaminebenzoate* melts at 152°. *p-Cresyl o-Sulphaminebenzoate. Phenyl o-Carbaminesulphonate*, $H_2NCOC_6H_4SO_3C_6H_5$, from the carbamine sulphone chloride and phenol, crystallizes from alcohol in plates or needles, m. p. 95°. It is much more stable than the isomeric phenyl sulphaminebenzoate. *o-Sulphone Chloride of Phenylbenzoate*, $ClSO_2C_6H_4COOC_6H_5$, crystallizes from glacial acetic acid in heavy prisms, m. p. 103°–104°; boiling with water, dilute hydrochloric or sulphuric acids, changes it to *o*-sulphobenzoic acid. When boiled with baryta water or with caustic potash, the products are the diphenyl ester and the Ba (or K) salt of *o*-sulphobenzoic acid. By the action of ammonia, it may be changed to the ammonium salt of the sulphinide; with aniline, the product is the anil; with phenol and dilute KOH, it gives the diphenyl ester. When the symmetrical chloride is treated with phenol and a slight excess of dilute KOH, at low temperature, the diphenyl ester is the sole product. Under similar conditions, the unsymmetrical chloride yields mostly the phenyl ester chloride, together with some of the diphenyl ester. This is the best method of preparing these substances. *o-Sulphone Chloride of o-Cresyl Benzoate*; rhombic crystals, m. p. 112°. M. T. BOGERT.

On Relations between the Color and the Composition and Constitution of the Alkali Salts of the Nitrophenols. BY J. C. W. FRAZER. *Am. Chem. J.*, 30, 309–323.—The author summarizes his results as follows:—(1) Orthonitrophenolates possess a color nearest the red end of the chromatic scale, meta come next, and para are furthest removed from this end. (2) The color grows lighter in the same series as the atomic weight of the metal increases. (3) The presence of water of crystallization has the greatest effect upon the color in the ortho series, less in the meta, and least in the para. (4) The *m*- and *p*-nitrophenols form acid salts, the ortho body does not. (5) The *o*- and *m*-nitrophenolates are red when dehydrated. (6) *p*-Nitrophenolates, except the sodium salt, are yellow when anhydrous and cold. (7) The nitrocresolates are all red. The variation of color from one salt to another is less than in the case of *o*- or *m*-nitrophenolates. Water does not cause as much change in the color of nitrocresolates or *p*-nitrophenolates as in the case of the *o*- and *m*-nitrophenolates. EXPERIMENTAL.—*o-Nitrophenolates.*— By suitable precautions, the *potassium salt* may be crystallized in the anhydrous state, and then appears in small red needles. *Rubidium Salt.*—Large orange-yellow plates, containing half a molecule of water; or red needles, when crystallized in the anhydrous condition. The anhydrous forms of both the K and Rb salts immediately become hydrated in presence of traces of moisture. *Cæsium Salt.*—Thick massive crystals of a dark scarlet-red color, containing no H_2O. *m-Nitrophenolates.*—*Sodium Salt* crystallizes in small orange-red needles with 1 H_2O. *Potassium Salt.*—Small needle-shaped crystals with 1 H_2O. *Neutral Rubidium Salt.*—Small yellow needle-shaped crystals. *Acid Rubidium Salt*, $O_2NC_6H_4ORb$, $O_2NC_6H_4OH$.—Brownish-red, needle-shaped crystals. *Acid Cæsium Salt.*—Beautiful, almost blood-red, crystals. *p-Nitrophenolates.*—*Sodium Salt.*—Large lemon-yellow prisms, containing 4 H_2O. On standing, 2 H_2O is lost, and the crystals become opaque. *Potassium Salt.*—Lemon-yellow crystalline powder, containing 1 H_2O. *Rubidium Salt.*—Yellow needles. *Cæsium Salt.*—Lemon-yellow plates, with 3 H_2O. *Nitrocresolates* (CH_3 : OH : NO_2 : : 1 : 2 : 3). *Sodium Salt.*—Small light-red needles, with 2 H_2O. *Potassium Salt.*—Light-red scales, containing half a molecule of water. *Rubidium Salt.*—Lustrous cherry-red scales, or monoclinic diamond-shaped crystals, with 1 H_2O. *Cæsium Salt.*—Red. Conductivity experiments with *o*-, *m*- and *p*-nitrophenols show the *o*-nitrophenol to be a weaker acid than the *p*-, while the *m*-is stronger than the *p*-. Nothing of particular interest was found on examining the absorption spectra of some of the salts. M. T. BOGERT.

Comparative Study of the *m*-Sulphaminebenzoic Acids Made by Different Methods. BY J. C. W. FRAZER. *Am. Chem. J.*, 30, 323–330.—*m*-Sulphaminebenzoic acid was prepared by the following methods: (1) By the action of caustic potash upon the *m*-sulphobenzoic diamide; (2) by long boiling of *m*-sulphaminebenzonitrile with dilute caustic potash; (3) by oxidizing *m*-toluene sulphone amide with chromic acid; (4) from the *m*-sulphone chloride of benzoic acid and aqueous ammonia. All these methods yielded one and the same *m*-sulphaminebenzoic acid. The pure acid, when heated rapidly, melts at 237°–238° (corr.), but when heated slowly, it may melt as low as 215°.

M. T. BOGERT.

PHARMACEUTICAL CHEMISTRY.

The Mydriatic Alkaloids. BY J. O. SCHLOTTERBECK. *Am. J. Pharm.*, 75, 454.—The writer reviews briefly the work of Pasteur, Ladenburg, and others, upon the relations existing between crystalline form, chemical composition and optical activity, which finally led to the theory of stereoisomerism. Among this class of compounds, some of the plant alkaloids are of particular interest and importance; particularly is this true of atropine and hyoscyamine. Ladenburg long ago established the formula $C_{17}H_{23}NO_3$ as that of these isomeric alkaloids, and likewise was the first investigator who determined the correct optical rotation of hyoscyamine, that of atropine being left in doubt until within quite recent years, when it was found to be optically inactive. Ladenburg later proved that both alkaloids are tropic acid esters of tropine, which, linked with the fact that hyoscyamine is easily converted into atropine, led him to conclude that atropine is the racemic form of hyoscyamine. More recently Amenomiya succeeded in converting atropine into *d*- and *l*-hyoscyamine.

A good commercial sample of atropine was saponified, yielding several products. One of these products, *i*-tropic acid, was split into *d*- and *l*-tropic acids and their quinine salts prepared. By decomposing these salts with strong acid both of the free acids were obtained, the *d*-tropic acid rotating $(\alpha)_D = + 71.30°$ and the *l*-tropic acid $(\alpha)_D = -72.75°$.

d-Hyoscyamine was prepared by mixing *d*-tropic acid and tropine, and *l*-hyoscyamine was prepared analogously from *l*-tropic acid and tropine; the former had an optical rotation of $(\alpha)_D = + 23.15°$, and the latter a rotation of $(\alpha)_D = -24.12°$.

Tested pharmacologically, Dr. Cushny found that *d*-hyoscyamine acts much more powerfully upon the spinal cord of the frog than does *l*-hyoscyamine, and that its action is but one-fifteenth to one-sixteenth as powerful as *l*-hyoscyamine upon the nerve terminations in the salivary glands, heart and pupil of mammals.

W. H. BLOME.

The Alkaloids of Adlumia Cirrhosa. BY J. O. SCHLOTTERBECK AND H. C. WATKINS. *Pharm. Arch.*, **6**, 17.—The entire dried plant was finely ground, moistened with diluted ammonia water, and then air-dried. This was exhausted by continuous percolation with chloroform. After recovery of the solvent, the waxy residue was taken up with acetic acid, filtered, made alkaline with ammonia water, and the precipitated matter filtered out. The alkaloids were dissolved from the precipitate formed by the addition of the ammonia, by acetic acid, again made alkaline, and immediately shaken out with ether. Several forms of crystals appeared which were mechanically separated, and carefully recrystallized many times. The following five alkaloids were found:

1. Protopine, $C_{20}H_{19}NO_5$, melting point 204°–205° C.
2. *b*-Homochelidonine, $C_{21}H_{23}NO_5$, melting point 159° C.
3. Adlumine, $C_{39}H_{39}NO_{12}$ or $C_{39}H_{41}NO_{12}$, melting point 187°–188° C. This alkaloid rotates the plane of polarized light $(\alpha)_D = + 39.88$.
4. Adlumidine, $C_{30}H_{29}NO_9$, meltin gpoint 234° C. A very small quantity of alkaloid was obtained, so that only two combustions were made.
5. Not named as yet, melting point 176°–177° C.

Tartaric and citric acids were also found. W. H. BLOME.

Aconite. A Comparison of the Chemical and Physiological Method of Assay. By A. B. Stevens. *Pharm. Arch.*, 6, 49.—Prof. Stevens points out the lack of confidence on the part of chemists, in the chemical methods of assay of aconite. He gives the results of several months' work on the comparison of a chemical, the Squibb, or tongue test, and a physiological test on a 30-gram frog taken as the standard.

He found that the chemical method of assay, which he gives, agrees quite generally with the tongue-tingling test proposed by Dr. Squibb a number of years ago ; but neither of these methods agrees with the physiological one, which seeks to establish the smallest dose necessary to kill a standard frog. The lethal dose for such a frog varies with the sex and condition of the individual frog taken, and is not constant.

Methods are given for the chemical assay of aconite root, its tincture, fluid extract and extract. The chemical method is stated to be unreliable for the assay of the extract, when long-continued heat was used in its preparation. Powdered aconite exposed to a dry heat of 100° for two hours remained uninjured. The best solvent for the active principles is 70 per cent. alcohol.

W. H. Blome.

SANITARY CHEMISTRY.

Comparison of Liquid Disinfectants. By B. R. Rickards. *Jour. Mass. Ass. of Boards of Health*, 13, 70–76. The author has very carefully tested the disinfecting power of solutions of carbolic acid, formaldehyde solution and eight proprietary compounds. These compounds were either coal-tar products containing cresols or solutions of metallic chlorides. One of the compounds was, however, a 3 per cent. solution of hydrogen peroxide. The method used was to take glass rods, sterilize them by heat, and infect them by emulsifying a 24-hour agar growth of diphtheria in water and dipping the rods into this emulsion and removing any excess by touching the end of the rods to the side of the glass tube containing the emulsion. In this way a uniform film of bacteria is obtained on the glass rods. After infection, the glass rods were dried for three hours in a sterile atmosphere and were then inserted into tubes containing either 1 or 5 per-cent. solutions of the different disinfectants and kept in the solutions for one, five, fifteen or thirty minutes. The results of these tests are given in tables and show that formaldehyde solutions commonly supposed to be superior to carbolic acid as a liquid disinfectant are much inferior to 1 and 5 per cent. solutions of the latter. In 1 per cent. solutions, with contact periods of one or five minutes, formaldehyde has apparently no effect, and with contact periods of fifteen and thirty minutes, only 50 and 80 per cent. of the glass rods used were sterilized, while a 1 per cent. carbolic acid solution with a contact period of one minute, sterilized 90 per cent. and with a contact period of five minutes, 100 per cent. With 5 per cent. solutions of formaldehyde, one minute contact sterilized 10 per cent., five minutes, 60 per cent., fifteen and thirty minutes, 100 per cent., while 5 per cent. solution of pure carbolic acid with one minute contact sterilized 100 per cent. The coal-tar proprietary compounds were also found to be very much better than formaldehyde solution, but not any better than carbolic acid, while the various metallic chlorides advertised as "Chlorides,"etc., were found to have very little value as disinfectants. The hydrogen peroxide solution, the three per cent. of commerce, when diluted as were the other disinfectants, was also of little value.

LEONARD P. KINNICUTT.

Normal and Polluted Waters in Northeastern United States. BY M. O. LEIGHTON, U. S. Geological Survey. *Water Supply and Irrigation Paper*, No. 79, Washington, 1903.—In the introduction are briefly and plainly stated, the essential qualities of water for various uses, the common impurities in natural waters, the difference between surface and underground waters, and the significance of the various chemical data obtained in the sanitary analysis of a water. The action of bacteria is also noted and the danger from germs of disease in a water, but in the main portion of the paper no bacterial data are given. The main portion of the paper reviews the important available records of water examinations which have been carried on in this country, except those now being prosecuted in connection with the Chicago drainage canal and the Illinois. river, and include the Merrimac river basin, the Blackstone river, the Connecticut river basin, the Housatonic river, the Delaware river and the Ohio river basin. The Merrimac river basin includes, besides the Merrimac, the Sudbury, the Asabet and the Nashua rivers. The analyses given, are those that have been made by the Mass. State Board of Health, and are very complete. With these analyses are also given data as to flow of the rivers, towns and cities on the streams, and chief sources of pollution. The analytical data regarding the Blackstone, which, according to the author, is the most polluted river in New England, show the amount of pollution caused by the sewage of the City of Worcester. The Connecticut river basin includes Millers, Deerfield, Chicopee, Ware, Quabog, Westfield, Hockaman, Park and Farmington rivers. The available analytical data are not as complete as is the case with the Merrimac river basin, but they show that pollution which enters the basin from the states of New Hampshire and Vermont is so small in quantity that the amount of chlorine is normal north of the Massachusetts state line. At Springfield, the first point on the Connecticut in Massachusetts where analyses have been made, marked indications of pollution are shown, which increase till the mouth of the river is reached. The river enters Massachusetts unpolluted, but in its passage through the state loses its value as a source of water supply and of ice. The Housatonic river, though a tributary to the Connecticut, is considered by itself. The amount of pollution is shown by analyses made at different points. It is too much polluted to be a safe potable water, but not sufficiently polluted to be noticeable to the senses. The Delaware river: There is no question about the pollution of this river, but the only available analytical data are analyses of the water at Trenton. Above Trenton there are 43 towns and cities that contribute polluting substances to the river. The Ohio river, formed by the union of the Allegheny and Monongahela rivers and emptying into the Mississippi at Cairo, has a very large water-shed, the total area being 214,000 square miles. This territory is very carefully worked over. Numerous plans are given showing the territory drained by the Ohio and its tributaries, the names of the towns and cities, with the population, are noted, the chief sources of pollution stated, the general character of the water described, and all available analyses given, which, though not numerous, taking into account the area covered, give a very good idea of the character of the rivers. In considering the character of the waters of the Ohio basin the author calls attention to the fact that a report of a water analysis, which, in the case of a New England water would be regarded as certain evidence of pollution, may, in case of Ohio waters, represent a truly normal water, and gives the following analyses to illustrate this point:

COMPARISON OF ANALYSES OF NORMAL SURFACE WATERS.
(PARTS PER MILLION.)

				Nitrogen as						
	Region.	Turbidity.	Color.	Albuminoid ammonia.	Free ammonia.	Nitrites.	Nitrates.	Chlorine.	Total residue.	Hardness.
1	Massachusetts	Very slight	6.6	0.199	0.013	0.000	0.037	1.7	34.7	8.0
2	Ohio basin	" "	4.0	0.514	0.062	0.024	1.500	2.0	730.0	43.6

LEONARD P. KINNICUTT.

Winter Treatment of Intermittent Filtration Sewage Beds. *Eng. Record*, 48, 592–594, 1903.—The editor of the *Eng. Record* has collected information from the following sewage plants regarding the winter treatment of sewage: Clinton and Worcester, Mass., Meriden, Conn., Woonsocket, R. I., Altoona, Pa., Ames, Ohio. At Clinton, five of the nineteen beds are furrowed, the furrows being 3 feet 6 inches apart, and 1 foot 6 inches deep from the top of the ridges. There are also three main furrows which run across these smaller ones and lead directly from the inlet in the middle of one side of the bed. These beds are only used when the temperature of the air is below 15°. When using one of these beds, the entire sewage of that day—700,000 to 1,200,000 gallons—is run upon it. When the sewage settles, the surface becomes frozen and the ice forms a roof across the furrows preventing the bottom of the furrow from freezing and allowing the sewage to filter through these parts of the bed. The roof of ice is allowed to remain till the next application of sewage, when it is melted by the fresh sewage. When the temperature is above 15°, the sewage is run upon the unfurrowed beds in periods of 120–150 minutes, the summer periods being from sixty to ninety minutes, the object being to thaw the surface of the bed and melt any ice which may have formed. If there is a snow fall of over six inches, paths are immediately shoveled through the snow, piling it into ridges ten to twelve feet apart. If the snow is not removed, it chills the sewage so that it becomes a mass of ice and does not run into the bed. At Worcester, where only the effluent from chemical treatment is filtered, the only preparation for winter is scraping and loosening the sand surface by harrowing. From December, 1902, to March, 1903, the average amount filtered per acre per day was 111,000 gallons. At Meriden there is no preparation for winter treatment. The engineer believes that the freezing of the surface of the beds does not detract from the successful working of the beds. At Woonsocket, there is also no preparation for winter use. The engineer does not believe that anything would be gained by so doing. At Altoona, there are forty beds used rather as irrigation than filtration beds, and upon which crops are grown. At the beginning of freezing weather, the sewage is shut off from all but four beds. These serve merely as settling basins and overflow from one to the other and then into the river. At Ames, there are two sand filters, each 55 x 150 feet, which receive 40,000 to 60,000 gallons of septic tank sewage daily. At the beginning of winter the filters are ridged, the ridges being 12 to 15 inches high, and as close as it is practical to make them. The sewage is applied automatically in doses of from 22,000–24,000 gallons. When the thermometer is continuously below zero, a roof of ice forms over the ridges, and the sewage flows underneath. In the ordinary working, the beds are loosened up once a month. In winter this is done when the surface of the bed is still wet from sewage, as the surface freezes between applications. In exceptional cases a little ice has been removed. Prof. Marston states that the per cent. of purification in winter is very high, though not so high as in summer, and the winter operation of sand filters in a climate similar to Ames has proved perfectly feasible, although it requires intelligent care.

LEONARD P. KINNICUTT.

Rural Water Supply with a Study of the Monongahela River Supply at Morgantown. BY C. D. HOWARD. *West Virginia Agr. Expt. Station Bulletin* **89**, 163–213.—A strong argument against the use of surface wells, and in favor of driven wells, or when this is not advisable on account of the geological formation, for the use of roof cisterns, illustrated by analyses of the water of surface and driven wells in or near Morgantown. In the study of the Monongahela river supply at Morgantown, analyses are given of the unfiltered and filtered water. The chemical and bacteriological analyses show that the unfiltered river water is not a safe potable water, and the author believes there is danger from the typhoid bacillus which at times must enter the river with the sewage of Fairmont, twenty-five miles above Morgantown. The amount of filtered water is to be increased from 1,000,000 to 2,000,000 gallons daily by the enlargement of the mechanical filtration plant. The paper concludes with a brief statement of the causes of typhoid fever epidemics.

LEONARD P. KINNICUTT.

A Small Open Sand Filter at Reading, Pa. *Eng. Record*, **48**, 566–568.—A detailed description, with plans, of a small but admirably constructed slow open sand filter. The plant consists of two beds of 0.5 acre net area. The main collector in each filter is 8 inches in diameter. The laterals, placed 10 feet apart, are 4 inches in diameter. These drains, laid with open joints, are covered first with 7 inches of 1- to 2-inch broken stone around the pipes, then a 2$^1/_2$-inch layer of 3/8–1-inch broken stone, on top of which there are 2 inches of 1/8-3/8-inch and a 1/2-inch layer of 1/6–1/8-inch broken stone. These layers of broken stone support 4 feet of Delaware river bar sand, effective size 0.27 mm. and uniformity coëfficient of 1.5. The usual depth of water above the sand is 3 feet. The filtered water-basin has a capacity of 9000 gallons. At the end of the filter there is an aërating chamber 8 x 14 feet to assist in removing odor caused by algae growth. The rate of filtration is high, 4,500,000 per acre per day. The average turbidity of the unfiltered water is 21.2 and contains 182.6 bacteria per cubic centimeter. The average turbidity of the filtered water is 2.1 and contains 3.1 bacteria per cubic centimeter giving a purification of 90.1 per cent. for turbidity and 98.3 per cent. for bacteria. LEONARD P. KINNICUTT.

Epidemic of Typhoid Fever Due to Impure Ice. BY R. H. HASTINGS AND A. W. WHEELER. *Am. J. Med. Sci.*, **126**, 680–684, 1903.—Sedwick, Winslow and Park, *Memoirs Amer. Academy Arts and Sciences*, Vol. XII, 472-578, as a result of their investigations make the following statement: "These considerations show that ice more than three months old is sanitarily as safe as a well-filtered water supply. Cases of typhoid fever, due to ice, might naturally be expected to occur, if at all, at the time immediately following the cutting of infected ice, and as this is done in January, usually, after March at the latest, the ice could hardly be held responsible for any trouble, even were it known to be infected." Dr. Hibbert W. Hill, in a paper on "Investigation of the Boston Ice Supply," *Boston Med. Jour.*, **143**, 557–561, this Journal, **24**, R. 238, states that there is only one presumably authentic case of transmission of typhoid fever through ice on record. This case occurred in France and resulted from the use in wine of ice taken from a river below the sewage outlet of the town. The following data, showing, as we believe, that the epidemic of typhoid fever, thirty-nine cases, at the St. Lawrence State Hospital at Ogdensburg, October and November, 1902, was due to impure ice is, therefore, of special interest.

Data: October 2nd, 3 cases; October 3rd, 2 cases; October 4th, 1 case; October 5th, 2 cases; making 8 within four days, all attendants in the same building. Local conditions about dining room and kitchen thoroughly investigated with negative results. The possibility of infection from milk, vegetables, or oysters, was eliminated after investigation. There remained only the water and ice to be considered. The water from a small Adirondack stream had been in use since December, 1900. The ice was cut from the St. Lawrence below Ogdensburg in February, 1902, and stored in an ice-house from which ice was taken for the first time six days before the first case of typhoid fever developed. The ice used previously to that date was cut at the same place, on the St. Lawrence river, but at a different time. A specimen of the water and of the ice was examined at the Binder Laboratory, Albany. Number of bacteria in 1 cc. of the water on agar plates, 11,000; on gelatine plates, 3600. The fermentation test showed no gas in eight tubes, with 1 cc. water. Number of bacteria in 1 cc. of the melted ice on agar plates, 30,400; on gelatine plates, 50,400. Out of eight fermentation tubes, each treated with 1 cc. of the melted ice, three showed presence of the colon bacillus. The ice in the ice-house was then examined by Hastings and Wheeler. Some of the cakes contained a dark brown or black granular matter solidly frozen in the ice. These cakes were examined. Ice was taken from the center of the cakes and melted. Considerable black sediment was obtained. Cultures made from the sediment and from the water, in bouillon, showed rapid growth, with fecal odor in all tubes. A series of plates was prepared in the usual manner and well-defined colonies isolated in the end plates. Five colonies were selected which presented characteristics resembling the typhoid bacillus, and from them fresh cultures were made. Of these cultures, three proved to be the colon bacillus, one was a bacillus not identified, while the fifth was a pure culture of the typhoid bacillus.

LEONARD P. KINNICUTT.

INDUSTRIAL CHEMISTRY.

Preparation of Pure Hydrogen for Airships by Liquid Air. *Scientific American*, October 31, 1903.—It is proposed to freeze out the impurities, especially hydrogen arsenide by chilling with liquid air in a gasoline bath at —130° C. over which the impure hydrogen is passed. S. P. SADTLER.

Coal Tar Oil in the Manufacture of Paint and Varnish. BY OSCAR MARKFELDT. *Scientific American Supplement*, August 1, 1903.—After describing the method of isolating benzene from coal-tar by distillation and removal of the phenol by means of lye, and pyridine bases by dilute sulphuric acid, the uses of benzene are described for making asphalt varnish from coal-tar pitch. The formula employed is:

	Parts.
Medium hard coal-tar pitch	90
Resin	40
Benzene 90°	100

and heated about an hour from 50° to 60° C. The use of benzene as a solvent for rubber is also referred to as being much practiced at present. S. P. SADTLER.

The Manufacture and Utilization of Mond Producer Gas for Industrial Purposes. *Scientific American Supplement*, August 15, 1903, p. 23,086.—Although much has been written on the subject of gas for industrial purposes, some of the points in the article are worthy of record. The gas may be manufactured out of the commonest slack and combined with great advantage with the recovery of the nitrogen as ammonium sulphate, which can be obtained to the extent of 90 lbs., worth $2, per ton of coal, while it is said that only 20 lbs. can be obtained by the retort distillation process.

The process is a combined water and producer gas process, as enough air is forced through the stratum of coal to keep up the temperature. The gas contains hydrogen, carbon monoxide, methane, carbon dioxide and nitrogen, but as the gas contains only 11 per cent. of carbon monoxide it is not so poisonous as water-gas. As to the production of the gas, one ton of coal will give 150,000 cubic feet of Mond gas, while it would only yield 10,000 cubic feet of ordinary gas coal. The calorific power is about one-fourth that of coal-gas.

The cost of production is so low that at Winnington, England, the gas is being sold at only 4 cents per 1000 cubic feet, which, if the comparison is a correct one as to heating value, would be the same as getting ordinary illuminating gas for power purposes at 16 cents per 1000 cubic feet.

The company operating the Mond patents in Great Britain, are erecting five enormous sets of producers to supply a district covering 135 square miles. The gas is to be sold at 4–6 cents per 1000 cubic feet. Each set is to cover 27 square miles, the gas is to have a pressure of 7 lbs. in the mains, decreasing to 2 lbs. in the branch pipes. Each works is to supply 12,000,000 cubic feet daily. S. P. SADTLER.

Metallic Calcium from Calcium Chloride. *National Druggist*, abstract in *Scientific American Supplement*, August 8, 1903, p. 23,070.—Reference is made to the process of Professor Borchers of the Electro-Metallischer Institut of Aix-la-Chapelle.

The process, in principle, is very simple, as the calcium chloride is fused by itself at a temperature above 800° C. The corrosive action of the chlorine and the ease with which the metallic calcium is oxidized, of course render various precautions necessary. The cost of production it is said is about 45 cents per 100 pounds, which, if true, will be of the greatest importance, as it will be substituted for sodium for many purposes, if obtained so cheaply. S. P. SADTLER.

Coloring of Metals. *Scientific American Supplement*, August 8, 1903, p. 23,073.—A large number of processes for producing colors on metals are given, which seem to be reliable. The formulas are from the work of Mr. Paul Malheibe, "la Revue des Produits Chimique." (Similar formulas are contained in Hiorn's "Metal Colouring and Bronzing," Macmillan and Co., London, 1892.) The processes in the above translation are for coloring steel violet, purple, yellow, green, etc., giving it a bronze effect, a lustrous black, blue-black, deep black, etc. Coating with magnetic oxide, etc. S. P. SADTLER.

New Technical Features in the Cement Industry. *Eng. Min. J.*, October 24, 1903.—Special points of interest in recent cement-making practice are the tendency to use ball and tube mills in preference to Griffin mills with stones.

The rotary kilns have been built as large as 10 feet in diameter by 130 feet long but 6 x 60 is still standard practice.

In Kansas, kilns are fired by natural gas but powdered bituminous coal, containing 30 per cent. volatile matter is said to give the best results. For a barrel of 350 lbs. an average of 110 lbs. of coal may be said to be used. S. P. SADTLER.

New Jersey Fire Brick. *Eng. Min. J.*, October 7, 1903.—Considerable fire-brick clay is being produced near Perth Amboy, N. J. The first grade of clay has the following percentage composition: SiO_2, 46.9; Al_2O_3, 35.9; Fe_2O_3, 1.1; alkalies, 0.44; combined water, 12.8; moisture, 1.5; TiO_2, 1.3 per cent.

Its refractoriness ranges between Seger cone 33 to cone 35 (1790° to 1830° C). The clays are of good plasticity but low tensile strength. In making bricks they are burned at 1330° to 1370° C.
S. P. SADTLER.

The Generation of Acetylene. BY J. M. MOOREHEAD. *Electrochemical Industry*, October, 1903.—Although calcium carbide and water react so readily, difficulties in the practical utilization of the material lie in that very fact. The reaction goes on as long as there is water in contact with the carbide, in spite of the pressure that would be formed in a confined space. The critical pressure of the gas is 750 pounds per square inch, and the heat of compression and generation would raise the temperature to a point above that of dissociation for the gas.

Acetylene will give from ten to twelve times the light of the same volume of ordinary gas and twice the number of heat units of the best water-gas. There are about 100 makers of generators and about 93,000 generators in use.

Three points to be considered are danger from overheating, from excessive after-generation, and from an explosion of a mixture of gas and air.

With regard to the toxic action of the gas, it is not poisonous, although, of course, it does not support respiration. Even if a burner or generator in a room leaked continuously or was fully discharged in a moderate-sized bedroom hermetically sealed, it is claimed that the atmosphere would be both breathable and non-explosive for several days, as far as the presence of acetylene is concerned. Furthermore, its strong odor would betray it promptly.

The heat of the reaction amounts to 414.6 calories per gram of pure carbide, or one part of carbide would evolve enough heat to raise one gallon of water 89.4° C. In all generators approved by the Board of Fire Underwriters, there is one gallon of water to each pound of carbide, to prevent danger due to overheating, for only in bicycle lamps and other small types of generators does water act on the carbide. Excessive pressure is provided against by the use of a water-seal of a few pounds capacity.

Acetylene, properly speaking, is not explosive, although it will burn with violence and increase of volume, due to the temperature, when ignited with the proper amounts of air. It requires 12.5 volumes of air to produce the maximum effect. This effect is increased because acetylene is an endothermic body, the temperature of combination reaching 4100° F.

The limits of explosive mixtures of acetylene and several forms of gases compared, are as follows:

	Start.		Max. explos.		Stop.		
	Gas.	Air.	Gas.	Air.	Gas.	Air.	Sp. gr.
Acetylene	3.1	96.9	12.5	87.5	24.1	75.9	0.92
24 C. P. water-gas...	7.8	92.2	17.0	83.0	23.0	77.0	0.64
Pintsch gas.........	4.8	95.2	9.0	91.0	11.0	89.0	0.73
Natural gas.........	6.5	43.5	11.0	89.0	11.8	88.2	0.56

S. P. SADTLER.

AGRICULTURAL CHEMISTRY.

The Chemistry of the Soil as Related to Crop Production. BY M. WHITNEY AND F. K. CAMERON. *U. S. Dept. Agr., Bureau of Soils Bull. No.* 22, 71 pp.—Several views decidedly contrary to those usually held are advanced in this bulletin along with the results of the investigations upon which they are based. In studying the relation of the plant food in the soil to crop yield, the Bureau has adopted the use of water extracts and has developed methods for the determination of small quantities of mineral matter in solution. Regarding the soil moisture as a nutrient solution sufficient for plant growth, many methods have been tried in the Bureau for extracting this moisture. Natural soil solutions have in some cases been obtained in small quantities by the use of a powerful centrifugal machine, but this method is not practical for general work and has not been successful in any case where the moisture content of the soil was lower than that necessary for vigorous plant growth. A conventional method believed to give comparable results has therefore been adopted. One hundred grams of the soil sample is stirred vigorously for three minutes with 500 cc. of distilled water. After standing twenty minutes, the supernatant solution is decanted and filtered under pressure through a Pasteur-Chamberland filter. The methods of analysis further employed are given in detail in an appendix and are also briefly summarized by the authors as follows: "The bicarbonates are determined by titrating the filtered aqueous extract of the soil with a dilute acid solution, using methyl orange as an indicator; the chlorides by titrating with a dilute solution of silver nitrate using carefully prepared potassium chromate as an indicator; the sulphates photometrically, using a modification of a method proposed by Hinds and Jackson; the nitrates by developing the color resulting from the addition of phenol-disulphonic acid, making the solution slightly alkaline with ammonia, and then comparing photometrically with a standard solution of potassium nitrate similarly treated; the phosphoric acid by comparing the color produced by adding molybdic acid to a solution containing phosphates in the presence of nitric acid with the color produced in a standard solution of sodium phosphate treated in a similar manner; the silica by the use of the nitric acid and molybdate solution, after allowing the soil solution to stand at least one hour, reading against the phosphate standard and subtracting the previous reading for phosphate ; the potassium from the color produced when an excess of potassium iodide is added to a solution of a platinic salt and photometrically compared with a standard similarly treated, and the calcium and magnesium by an adaptation of the well-known Clark soap method, modified by Winkler, Warthe, and others." These methods were employed in numerous field determinations made on types of soil in New Jersey, Maryland, and North Carolina varying greatly in agricultural value. The data are in part included in the bulletin. The results, according to the authors, show no apparent relation between the dissolved salt of the soil and the yield of crops and no constant differences as regards the composition of the soil solutions obtained in types of soil varying widely in their crop values. Neither was there any material difference found in the dissolved salt content of the first, second, and third foot, from which the conclusion is drawn that the soil proper does not contain materially more soluble plant food than does the subsoil. The average of 147 determinations showed the presence of 7.64 parts of phosphoric acid, 5.47 of nitric acid, 11.67 of calcium, and 22.74 of potassium per million of dry soil. These figures are believed to represent very closely the amounts of these constituents in the great majority of cultivable soils. In practically all the soils examined, these constituents have been present in quantities sufficient for the production of medium to good crops. The examination of soil solutions obtained by centrifugal force, as well as by the method described, indicated a remarkable uniformity in the concentration of the different constituents in the soil moisture. A difficulty has been met with in the examination of dried samples, inasmuch as it has been found that the drying of soils affects not only the solubility of the mineral constituents but the organic matter as well. The following statement may be quoted as giving the views repeatedly expressed in the bulletin. "The conclusion seems inevitable that all our principal soil types, in fact, practically all cultivable soils, contain naturally a nutrient solution which varies within comparatively narrow limits with regard either to composition or concentration and which is usually sufficient for plant growth. Apparently, therefore, all these soils are amply supplied with the necessary mineral plant foods and these plant foods are not in themselves a matter of such paramount importance to the agriculturist, for their supply as regards the plant is determined by the supply of soil moisture which the crop can obtain from the soil. The chemical analysis of a soil can not in itself, therefore, throw much light upon the problem of fertility, but, when attempting to control the factors governing crop yield, attention must be directed to the mechanical condition of the soil as affecting the supply of soil moisture, with its dissolved mineral nutrients, to the effects of climate, to rotation, etc." These factors, including climate, texture of soil, rotation, and variety of plant, are discussed at some length, as is also the rôle of fertilizers. Finding essentially no chemical differences in solutions from soils producing large and small crops, and finding in practically all soils so far examined an excess of the fertilizer ingredients actually needed by plants, and also, at most, only a temporary increase in the amount of water-soluble salts in soils following the application of fertilizers, it is thought by the authors that the well-established beneficial effects of fertilizers under certain conditions require other explanation than that generally accepted, namely, the supplying of plant food in available form. The controlling factor in plant production is believed to be a physical one, the exact nature of which is as yet undetermined. H. W. LAWSON.

Pineapple Culture. I. Soils. BY H. K. MILLER AND H. H. HUME. *Fla. Agr. Expt. Sta. Bull. No.* **68**, pp. 669–698.—Chemical and mechanical analyses are given of about 40 samples of soils and subsoils from the pineapple districts of Florida. Notes are also given on the characteristic vegetation of the localities from which the samples were obtained. The soils, as a rule, are shown to be deficient in plant food. Without the application of fertilizers, few of the soils are capable of producing more than two or three crops of pineapples. The mechanical analyses show very small quantities of clay, silt, and very fine sand. Acid soils and soils containing much lime are not suited to pineapple culture. H. W. LAWSON.

Calcium Cyanamide: The New Nitrogenous Fertilizer and Source of Cyanides. BY G. ERLWEIN. *Am. Gas Light J.*, 79, 532.—Calcium cyanamide, which may be obtained by heating calcium carbide or carbide-forming mixtures in the presence of atmospheric nitrogen freed to a certain extent from the oxygen normally associated with it, promises to be of great value in agriculture as a nitrogenous fertilizer. This article, which is an abstract of the paper as presented before the recent International Congress of Applied Chemistry, calls attention especially to the industrial use of cyanamide in the production of cyanides by fusion with alkaline chlorides. In a paper read by A. Frank before the same Congress, and published in full in *Ztschr. angew. Chem.*, **16**, pp. 536–539, is given a full account of the work of Frank and Caro in developing this process of rendering atmospheric nitrogen available for agricultural and industrial purposes. In other foreign publications very favorable reports have also been made concerning the fertilizing value of cyanamide.

H. W. LAWSON.

The Status of Phosphorus in Certain Food Materials and Animal By-products, with Special Reference to Inorganic

Forms. By E. B. Hart and W. H. Andrews. *N. Y. State Agr. Expt. Sta. Bull. No.* 238, pp. 181–196.—As preliminary to proposed investigations on the metabolism of phosphorus in the animal body, the authors studied the occurrence of inorganic and organic forms of phosphorus in vegetable and animal feeding-stuffs, their efforts being directed mainly to the elaboration of a method for separating and estimating the phosphorus in inorganic combinations. In determining total phosphorus, the magnesium nitrate and the Neumann methods yielded practically the same results. The method of determining inorganic phosphorus finally adopted consisted in extracting 5 grams of the sample with 125 cc. of 0.2 per cent. hydrochloric acid, the mixture being shaken vigorously for fifteen minutes. The liquid is decanted through a filter-paper and the residue is washed with water until about 500 cc. of filtrate is obtained. 200 cc. of the filtrate are neutralized with ammonia, using litmus as an indicator, and 10 grams of ammonium nitrate are added. The solution is warmed to 65° C. and 2 cc. of nitric acid, specific gravity 1.20, and 25 cc. of neutral ammonium molybdate are added. The extract is kept at 65° for fifteen minutes and filtered after one hour. The phosphorus is determined as magnesium pyrophosphate, which after ignition is dissolved in dilute nitric acid and reestimated. The commercial feeding-stuffs of vegetable origin and some of the animal feeding materials were not found to contain appreciable quantities of phosphorus in inorganic combinations. In meat meal containing bone, inorganic phosphorus, however, was present. In germinating seeds rich in organic phosphorus, no transformation into inorganic forms was observed. In concluding remarks, W. H. Jordan states his belief that the results demonstrate the absence of any appreciable amounts of inorganic phosphorus in unmodified plant tissue, particularly seeds and grains.

H. W. Lawson.

The Cold Curing of Cheese. *U. S. Dept. Agr., Bureau of Animal Industry Bull. No.* 49, 88 pp.—Coöperative experiments on a commercial scale were carried out by the Wisconsin and New York State experiment stations under the auspices of the Dairy Division of the U. S. Department of Agriculture. The western experiments were conducted by S. M. Babcock and H. L. Russell assisted by U. S. Baer, and the eastern experiments by L. L. Van Slyke, G. A. Smith, and E. B. Hart. In each of the two series of experiments, representative cheeses from several States were cured at temperatures of 40°, 50°, and 60° F., and the commercial quality of the product was determined by a committee of experts. In addition to the influence of temperature upon the quality of cheese, other subjects were studied, such as the loss of weight and the effects of coating cheese with paraffin. In both series of experiments, cheese cured at low temperatures was superior in quality, confirming under commercial conditions results already obtained in experimental studies. The loss of moisture was also less at the lower temperatures. Cold curing has therefore been demonstrated to increase both the yield and market value of cheese. The keeping quality of cheese was enhanced by cold curing. The practice of coating cheese with paraffin was also supported by the results obtained. At the New York Station, chemical analyses were made of the cheese at frequent intervals. The paracasein monolactate decreased with the age of the cheese and more rapidly at higher than at lower temperatures. The amido compounds and ammonia are looked upon as possibly associated with the development of flavor in cheese. Their formation increased with an increase in temperature and with the age of the cheese. The New York work has also been published as Bulletin 234 of the State Station and a portion of the Wisconsin work as Bulletin 101 of that Station. H. W. LAWSON.

Conditions Affecting Chemical Changes in Cheese Ripening. BY L. L. VAN SLYKE AND E. B. HART. *N. Y. (State) Agr. Expt. Sta. Bull. No.* **236**, pp. 133–163.—Thê conditions studied were time, temperature, moisture, size of cheese, salt, rennet, and acid, the results of the experiments being summarized by the authors as follows: "The formation of water-soluble nitrogen compounds increases as cheese ages, other conditions being uniform. The rate of increase is, however, not uniform, since it is much more rapid in the early than in the succeeding stages of ripening. The amount of soluble nitrogen compounds increases, on an average, quite closely in proportion to increase of temperature, when other conditions are uniform. Other conditions being alike, there is formed a larger amount of water-soluble nitrogen compounds in cheese containing more moisture than in cheese containing less moisture. Cheeses of large size usually form water-soluble compounds more rapidly than smaller cheeses under the same conditions, because large cheeses lose their moisture less rapidly and after the early period of ripening have a higher water content. Cheese containing more salt forms water-soluble nitrogen compounds more slowly than cheese containing less salt. This appears to be due, in part, to the direct action of salt in retarding the activity of one or more of the ripening agents and, in part, to the tendency of the salt to reduce the moisture content of the cheese. The use of increased amounts of rennet-extract in cheese-making, other conditions being uniform, results in producing increased quantities of water-soluble nitrogen compounds in a given period of time, especially such compounds as paranuclein, caseoses and peptones. Acid appears to be essential to the formation of water-soluble nitrogen compounds in normal cheese-ripening, but the exact influence of varying quantities of acid upon the chemical changes of the ripening process has not yet been fully studied." Such compounds as paracasein, caseoses and peptones usually decrease as ripening progresses, and after a while disappear, while amido and ammonia compounds continue to increase. The formation of soluble nitrogen compounds is more rapid during the early stages of ripening. Moisture increases the chemical changes by favoring the action of ferments and by diluting their products. H. W. LAWSON.

The Role of the Lactic Acid Bacteria in the Manufacture and in the Early Stages of Ripening of Cheddar Cheese. BY H. A. HARDING. *N. Y. (State) Agr. Expt. Sta. Bull. No.* 237, pp. 165–180.—The lactic acid bacteria, which are always present in factory milk, convert the milk-sugar into acid and in this way tend to prevent the growth of other species which prefer a neutral or slightly alkaline medium. The lactic acid thus formed hastens the curdling action of rennet and forms with paracasein two compounds, one the paracasein monolactate constantly present during the making and ripening of cheese and necessary to the digestive action of the rennet enzyme, and the other the paracasein dilactate formed only in the presence of a greater quantity of the acid. The lactic acid bacteria, therefore, play an all-important part in the ripening of cheese up to the point where the digestion by rennet ceases. As the action of the enzymes of the milk itself is not confined to the early stages of ripening, this subject is to be discussed in a separate bulletin. The action of the rennet enzyme is not believed to extend beyond the formation of peptones, leaving the formation of the simpler compounds characteristic of ripened cheese as yet unexplained. Experimental data in support of the author's views are given in the bulletin. H. W. LAWSON.

The Cornstalk Disease. Chemical Investigations. BY S. AVERY. *Neb. Agr. Expt. Sta. Rep.*, 1902, pp. 85–94.—Chemical examinations of the stomach contents of cattle which had died of cornstalk disease, and of cornstalks have so far failed to reveal the cause of the disease. H. W. LAWSON.

PATENTS.

MAY 26, 1903.

729,362. George F. Lebioda, Boulogne sur Seine, France. **Impregnating wood.** The wood is saturated with gelatine and with four times as much formaldehyde as it is to contain finally, dried at 100 to 120° C., the formaldehyde driven off being condensed.

729,428. Matthew P. Shaffer, Vandergrift, Pa. **Welding compound.** Iron or steel shavings or filings 16, sal ammoniac and burnt borax each 4 parts.

729,492-3. James B. Hannay, Loch Long, Scotland. Making

white pigment. Both patents relate to the construction of a furnace for lead sulphate in which the pigment is collected in bags suspended in a chamber, and provided with baffle plates above the bags that can be shaken so as to dislodge the pigment. The furnace has a basic lining and means for feeding into it granular galena.

729,502. Martin Moest, Hochst-on-Main, Germany. Assignor to Farbwerke vorm. Meister Lucius und Bruning, same place. **Oxidizing organic compounds.** Cerium compounds are brought into reaction with organic substances in acid solution and the mixture treated with an electric current.

JUNE 2, 1903.

729,600. Henry C. Jones, Raton, N. Mexico. **Detergent.** Rochelle salts and sodium bicarbonate 1 part each, sodium chloride 8, and sodium hydroxide 10 parts dissolved in water.

729,601. Myrtil Kahn, Elberfeld, Germany. Assignor to Elberfeld Co., N. Y. **Azo dye.** *o*-amido phenol-*p*-sulphonic acid reacts on 1-5-amino naphthol to make a brown-black powder, soluble in water and alcohol red-violet, in concentrated sulphuric acid violet-red, a brown precipitate forming on the addition of ice, dyeing wool from acid baths brown-violet, turning black on chroming.

729,617. Calvin W. Link, Jersey City, N. J. **Facing for metal casting.** Corn oil 3, and kerosene 1 part mixed and sprayed over core sand, about 1 per cent. of the sand.

729,637. Ed. F. Myers. Akron, Ohio.. **Composition for cores.** Dextrin and sand or pulverized quartz.

729,643. Max Neumann, Hamborn, Germany. Assignor to Franz Meyer, same place. **Sulphuric acid.** Kiln gases are passed through a plurality of Glover towers, and through alternate heating and cooling zones intermediate of said towers, the heating zones deriving their heat from the kiln gases, and in inverse order from the last to the first of the series.

729,680. Wilhelm Schwartz, Hanover, Germany. **Nicotine absorber.** A plug of moss peat, placed in a tobacco pipe.

729,711. Georges Adrot, Marseilles, France. **Artificial fuel.** Petroleum is incorporated with sodium resinate, pulverized carbon added, and the whole mixed in a heated condition with water carrying a metallic salt such as calcium chloride, cooled, dried and made into briquettes.

729,735. Adolph Clemm and Wilhelm Hasenbach, Mannheim, Germany. **Sulphuric anhydride.** Hot roaster gases are led over a mixture of oxides of copper and chromium, then passed through a filter of porous substances and finally brought into contact substances.

729,749. Robert Freerichs, Elberfeld, Germany. **Artificial hair.** A colored cellulose fiber of suitable thickness, made from cellulose solution in copper oxide ammonia, is treated with an alcoholic solution of an oil and powdered talc.

729,752. Elmer Gates, Chevy Chase, Md. Assignor to Theoder J. Meyer, Washington, D. C. Apparatus for making **alloys.** A series of receptacles for molten metals, each with a discharge outlet and means for gradually opening one outlet and closing one, a mixing vessel to receive the metals and deliver the alloy to a mold.

729,754-5-6 are the same for **similar apparatus,** the last claiming a casting in which the proportions of the component metals vary gradually and inversely from end to end, said casting being subdivided into individual pigs or ingots.

729,760. Gerardo V. Guzman, Sucre, Bolivia. Separating **silver.** The ore is treated with a solution of copper chloride of determining strength, then passed through granulated copper, and the metallic silver collected.

729,767. George F. Jaubert, Paris, France. Making **hydrated calcium peroxide.** Powdered slaked lime and hydrated sodium peroxide are mixed and the dry mixture treated with moist air free from CO_2 till a small quantity of moisture has been absorbed without heating.

729,775. Arthur E. Krause, Jersey City, N. J. **Separating oil from water.** The mixture of grease, water or steam is passed through a magnesium body, as a serpentine sand.

729,805. John Stoveken, Cripple Creek, and Leo Stoveken, Florence, Colo. Apparatus for **extracting metals.** An ore bin provided with feeding apparatus delivers to a pulverizer, and this into a cyanide tank with automatic measuring feed for the solution, the regulating devices coöperating, overflow tanks with agitators arranged stepwise and a pump for returning the solution from the last tank to the first, together with suitable filtering and precipitating tanks.

729,819. Jean F. Webb, Denver, Colo. Assignor to Pneumatic Process Cyanide Co., Colo. Apparatus for **extracting metals.** A tank for chemical extraction, with filter bottom, and pipe with lateral branches above the filter and connected with air supply to agitate the contents of the tank and supply oxygen thereto.

729,833. Harry S. Amwake, Camden, N. J. **Solution for primary batteries.** A battery with porous partitions has on one side 10 parts water and 7 of sodium hydroxide, and on the other side 10 of water to 5 of sodium bichromate and 9 of sulphuric acid.

729,837. Carl W. Bilfinger, Fayetteville, N. C. Assignor one-half to Wm. M. Morgan, same place. **Paint vehicle.** Oxide of lead, creosote or tar oil and cottonseed oil in equal parts mixed by air blast.

729,838. **As above** for adding dry powdered alkali to tar oil, filtering, adding oxide of lead, 5 pounds to 50 gallons, washing with water and separating the oil which is mixed with cottonseed oil to form a substitute for linseed oil.

729,874. August L. Laska, Offenbach-on-Main, Germany. Assignor to K. Oehler, Anilin Fabrik, same place. **Olive-green sulphur dye.** Diformyl-*m*-phenylene diamine is heated with sodium sulphide and sulphur in the presence of zinc chloride, forming a black, brittle mass, soluble in concentrated sulphuric acid dirty green, and in water greenish yellow, from which HCl separates a yellow-brown precipitate soluble in soda-lye and ammonia.

729,876. Rudolf Lesser, Berlin, Germany. Substitution products of **aromatic amines.** A halogen or nitro group is introduced into corresponding phthalimides, converting them into the corresponding phthalimidine acids and decomposing these with aromatic amines, to form nitro and halogen substitution products.

729,920. Jacob W. De Castro, New York, N. Y. **Making sugar.** Defecates a saccharine liquid by mixing it with lime and carbon dioxide under pressure.

729,976. Joseph Tillman, Quitman, Ga. Making **sugar-cane syrup.** Cooks the juice to a syrup with skimming and adds one-fifth water and a tablespoonful of potassium nitrate to each gallon of water then repeatedly skimming with fine skimmers.

729,990. Ernst Zuhl, Berlin, Germany. **Celluloid compound.** Nitrated cellulose, acetyl cellulose and camphor equal parts, are mixed and worked up.

730,032. George H. Lindenberger, Louisville, Ky. Assignor to Kentucky Product Co., same place. Obtaining **nicotine.** The vapors thrown off in the process of drying tobacco are brought in contact with sulphuric acid in a gas scrubber.

730,111. August Grantidorffer, Magdeburg, Germany. Boiling **sugar solutions.** In boiling down sugar syrup the carbon dioxide is introduced into the syrup while heated to the same temperature as the syrup.

730,126. Robert Hutchison, Prestwich, Scotland. **Golf balls.** Gutta percha or balata is hardened by extraction with naphtha, then mixed with lime and sulphur and masticated. Five per cent. of lime and 1 to 2 per cent. of sulphur.

730,127. As above for the ball so made.

730,142. Stephen L. Mershon, Montclair, N. J. **Purifying iron.** The molten metal while falling in a thin sheet in the furnace is subjected to the direct action of a blast of burning hydrocarbon, wet steam and oxygen.

730,148. Paul E. Oberreit, Ludwigshafen-on-Rhein, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Halogenized indigo.** Cyanmethyl anthranilic acid is acted on successively by bromine, caustic alkali, acetic anhydride, caustic alkali and air. Dibrom indigo is produced by acting on acetylated monobrom indoxyl with caustic alkali and air.

730,175. Jokichi Takamine, New York, N. Y. **Suprarenal extract.** The suprarenal glands are steeped in warm water for some hours, filtered and pressed, evaporated till the mineral salts will crystallize out on the addition of alcohol, which is distilled off and the liquid further concentrated, fixed caustic alkali and ammonium chloride added and the product obtained in crystalline form which is separated, washed with water and alcohol and dried.

730,176. **As above** for the product which has a definite physiological action, an alkaline reaction, and gives a green color with ferric salts, a red color with iodine, and has the formula $C_{10}H_{15}NO_3$.

730,196. Jokichi Takamine, New York, N. Y. **Suprarenal extract.** Similar to the above process of 730,175, except in using ammonia in place of the fixed alkali for separating the product.

730,197 and 730,198 are all to same for **same extract,** the last step being omitted and the solution concentrated.

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730,231. Henry P. Bush, Philadelphia, Pa. **Antiseptic compound.** Potassium chloride 1½, calcium chloride 2¼, zinc chloride 50, sodium chloride and alum each 6, chlorinated lime 2, all pounds and formaldehyde 5 per cent. of the entire mixture, water 180 gallons.

730,288. Adam McCracken, Dunedin, New Zealand. **Safety explosives.** Picric acid is dissolved in glycerol, infusorial earth added, also ammonium carbonate, an aqueous solution of potassium nitrate and the mixture boiled, a little sulphur added and the whole thoroughly dried.

730,305. Charles Shepherd, Providence, R. I. Treating **wool wash.** A deodorizer as bleaching-powder 10 pounds to 1000 gallons is added, then chloride of lime, potassium permanganate and muriatic acid.

730,385. Peter W. McCaffrey, Denver, Colo. Assignor to Union Ore Extraction and Reduction Co., same place. Apparatus for **precipitating metals.** A perforated rotary receptacle is hung on the walls of a tank and filled with scrap iron to precipitate copper, the receptacle being partially immersed and rotating.

730,439. Viggo Drewsen, New York, N. Y. Making **wood pulp.** The wood is first soaked in a solution of magnesium monosulphite, then put in the digester with a bisulphite and cooked.

730,454. Adolph A. Gurtner, Berne, Switzerland. Making **colored photographs.** An orthochromatic negative is made with a light filter and printed in blue, and on this is superposed a print from yellow to red made from a second negative, or an orange-colored negative is placed on an orthochromatic film and both plates simultaneously exposed and developed, while a blue-colored print is got from the orthochromatic film with an iron salt, and on this print a yellow to orange print on a celloidin film is floated.

730,462. Edward D. Kendall, Brooklyn, N. Y. **Treating ores.** Pulverized auriferous magnetite is mixed with pulverized auriferous pyrite, the mixture first heated without air then oxidized with air, and the cooled mass lixiviated with a solution of a halogen or a cyanide.

730,479. John T. Saltiel, Denver, Colo. **Artificial stone.** Granite 15, glass 2, sand grit 40, cinder clinker 8, pebbles 13, hydraulic lime 15, and ocher 7, all finely ground are mixed with a liquid consisting of egg-shells 3 dozen, vinegar 1 quart, fat soup 1 quart, and warm water 4 quarts.

730,480. As above for the liquid alone.

730,505. Cushing Adams, Bellows Falls, Vt. **Calcimine.** Soda-ash and caseïn are mixed and ground, borax added and 7 parts of the mixture combined with 92 parts of a mineral base and 1 part of powdered alum.

730,506. As above for a **paint.** Fifteen parts of the soda caseïn mixture are combined with 75 parts of a mineral base, 10 parts lime and 1 part alum.

730,594. Willard S. Atkinson, New Brunswick, N. J. **Inclosed fuse for electric circuits.** A fuse wire and terminals surrounded by a mixture of comminuted mica and sodium bicarbonate, and the whole inclosed in a glass tube.

730,600. Leonce Beaumel, Toulouse, France. **Artificial statuary marble.** Alum is dissolved and boiled in water, barium sulphate added to a paste which is evaporated, cooled and stirred, and fragments of colored material added to imitate marble, etc.

730,630. Otto Friz, Nuremberg, Germany. **White cement.**

Lime and clay free from iron are mixed with porcelain frits and burned just below fusing.

730,702. Alexander S. Ramage, Cleveland, Ohio. **Food from milk.** Milk is made alkaline, heated, a coagulant added and then the caseïn digested with steam at a pressure of 100 pounds per square inch.

730,703. As above for making **lactose** from whey. Whey is made alkaline, concentrated one-half, the proteids removed, concentrated to one-sixth, and the lactose precipitated by alcohol.

730,723. Auguste Verschuren, Antwerp, Belgium. Apparatus for **disinfecting** and fire extinguishing. Apparatus for mixing chemicals with a water discharge, a nozzle with a branch and a reservoir on the branch, a removable cover, an air-hole and means for closing it, a cock and a pierced disk between the reservoir and nozzle, and means for inserting disks of differently sized holes.

730,746. Michael R. Conley, Brooklyn, N. Y. Assignor to Electric Furnace Co., same place. **Making steel direct.** Adds carbon enough to the ore to combine with all the oxygen, melting in a closed furnace and collecting the metal on a hot hearth.

730,771. Karl Jedlicha, Basle, Switzerland. **Yellow acridine dye.** The leuco compounds of amino acridine are treated with acetic aldehyde, forming a red-brown powder easily soluble in cold water, with orange color and green-yellow fluorescence, difficultly soluble in cold alcohol, and insoluble in ether and benzene, producing on leather and mordanted cotton clear orange shades.

730,778. George Kunick, London, England. **Tiles,** etc. A mixture of sand and lime is molded in perforated molds and saturated with carbon dioxide, then burned.

730,800. Paul E. Schoenfelder, Newark, N. J. **Photographic toning** and **printing compound.** (A) Fulminating gold from 1 grain $AuCl_3$ and 1 minim of ammonia, 3 grains of lithium chloride and 4 ounces of collodion. (B) Silver nitrate and glycerol each 45 grains, alcohol 150. Pour B into A and shake, then add 15 grains of citric acid dissolved in 60 minims of alcohol and an equal amount of castor oil and alcohol.

730,816. Edward W. Comfort, Chicago, Ill. **Thermostat.** The expansible member is the case of the instrument which has two tubes for the supply of fluid under pressure led in at the lower end acting on a system of levers and valves to regulate the supply of steam to the radiators.

730,834. Stephen L. Mershon, Montclair, N. J. **Refractory article.** Produced by the application of graduated rise of temperature to a foliated or fibrous mass of magnesium silicate.

730,835. David Mosher, San Francisco, Cal. Assignor one-half to David Beatty, Berkeley, Cal. Ammonia cyanide process of **treating ores** of precious metals. Ores containing gold or silver with zinc, copper, nickel, etc., are roasted to form sulphates, arsenates or tellurates, dilute ammonia is then used to oxidize the reducing substances, finally extracting the metals with an ammonia-cyanide solution, containing an excess of cupric oxide solution, over and above that necessary to form double salts.

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730,888. Joseph W. Dowler, St. Louis, Mo. **Milk product.** A little acid calcium phosphate is added to waste milk, which is filtered, concentrated and the filter residue added, together with more acid phosphate, about 30 pounds to 160 pounds of the original milk, the mixture being then dried.

730,897. Frank Fisher, Brooklyn, N. Y. **Ink reducer.** Sweet oil is heated, mixed with equal parts of varnish and balsam copaiva and filtered, then citron oil and japan drier, 0.1 part each, added.

730,926. Masataro Kobayashi, Ise, Wateraikori, Tamaru-Machi, Japan. **Medicine wrapper.** Composed of equal parts of starch and gelatin.

730,941. Frederick W. Matthiessen, Lasalle, Ill. **Producer gas.** The coal in one part of a fire-chamber is subjected to reflected heat from air currents passing through the coal to distil and oxidize both hydrogen and carbon, by air admitted over the coal, and oxidizing the coke in the lower part of the chamber.

730,979. Heinrich Specketer and Oscar H. Weber, Griesheim-on-Main, Germany, Assignors to the firm Chemische Fabrik Griesheim Electron, Frankfort-on-Main, Germany. **Alkali metals.** Aluminum and alkali fluoride are mixed and heated in a distilling apparatus, the reaction being $6KFl + Al = 3K + AlK_3Fl_6$.

731,002. James Williams, Hackney Wick, London, England. Assignor to Oriental Waterproof Syndicate, same place. **Waterproofing.** Copper cuttings are oxidized in ammonium carbonate and the fabric impregnated and dried.

731,055. Maurice Jacobi, Philadelphia, Pa. Assignor one-tenth to Oscar G. Boehm, same place. Apparatus for **oxidizing metals.** A heated casing and pots therein each with its supply of metal and acid, and a regular supply of cool air.

731,070. Edgar F. Price, Niagara Falls, N. Y. Assignor to Union Carbide Company, same place. **Calcium carbide.** Calcium carbide and bituminous coal both in powder are mixed, retorted and crushed.

731,082. Otto C. Strecker, Darmstadt, Germany. Preparing metals for **lithographic printing.** An insoluble and hygroscopic layer firmly adherent to the printing plate is formed on its surface by the action of a mixture of salts of ammonium silicofluoride and ammonium nitrate, equal parts, each acid forming an insoluble compound with the zinc plate according to the equation, $(NH_4)_2 SiF_6 + 3Zn + 3(NH_4)NO_3 = 3ZnF_2 + (NH_4)_2SiO_3 + 3NH_4NO_2$.

731,100. Alexander Dick, London, England. Assignor to the American Brass Company, Waterbury, Conn. **Uniting metals.** The metal is heated but not melted, the ends cut to a fresh surface and held against the cutting tool to prevent oxidation, and the fresh surfaces are pressed together with a welding pressure.

731,105. Thomas T. Gaff, Barnstable, Mass., and Joseph F. Gent, Mount Clemens, Mich. **Purifying brine.** A brine bath is applied to Indian corn to separate the starch from the germs by continuous circulation and removal of the germs outside of the corn tank, all starchy and glutinous matters being separated before the brine reënters the tank.

731,106. As above for the **apparatus** employed, consisting of a settling tank provided with pockets interposed between the brine tank, the corn tank and the filter press.

731,139. Arnold Steiner, Basle, Switzerland. Assignor to Chemical Works, formerly Sandoz, same place. **Aromatic aldehyde sulphonic acid.** Methyl benzene sulphonic acids are oxidized in the presence of anhydrous sulphuric acid, forming transparent, white needles or tablets soluble in water and combining with phenylhydrazine to a yellow, very soluble hydrazone.

731,152-3. William J. Armbruster, St. Louis, Mo. **Pigment** and process of making it. Solutions of zinc sulphate and alkaline hydroxides are mixed, solutions of sodium carbonate and barium sulphide added, the resulting precipitates separated and mixed.

731,169. Oscar A. Ellis, El Dorado Canyon, Nev. Apparatus for **extracting metals.** A receiving hopper with an inclined bottom and pipes supplying chemical solutions to the ore near the top of the hopper and also near the outlet thereof.

731,184. Evan H. Hopkins, London, England. **Obtaining zinc.** The ore is heated in the presence of a reducing agent with exclusion of air and flame, the vapors condensed on a mass of carbon with exclusion of air and the liquid zinc collected below the carbon.

731,290. Viggo Drewson, New York, N. Y. **Cellulose products** from corn-stalks, etc. The stalks are first comminuted, then cooked in caustic soda of such strength as to disintegrate the pith only, separating this from the shells and further cooking the shells of the stalks.

731,308. Ernst W. Jungner, Stockholm, Sweden. **Electrodes.** A metallic cathode having regularly disposed conducting points is placed opposite a metallic anode in a solution of an alkali metal hydroxide, with a salt adapted to combine with said metal and to dissolve less rapidly than it forms, such as oxychlorides of nickel.

731,310. Hermann L. Kubbernuss, St. Louis, Mo. **Plaster.** Calcium sulphate 30, cork meal 10, alum 3, glue 5, coal cinders 7, boiled animal hair 5, slaked lime and sand 20 each.

731,340. George Chism, Carrollton, Ill. Assignor to the Mexican Disinfectant Co., same place. **Disinfectant.** Caustic lime one barrel, boneset extract two gallons, crude carbolic acid half gallon, copperas 25 and Spanish brown 30 pounds.

731,385. Paul E. Oberreit, Ludwigshafen-on-Rhein, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Indoxyl.** Phenylglycine orthocarboxylic acid is heated with caustic alkali in a vacuum till converted.

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731,432. Walter Cole, Montreal, Canada. Making **cheese.** The milk is partially separated, 10 per cent. of the lighter constituents acidified, oxidized by aëration fifteen to twenty minutes, the treated portion added to the main bulk, and allowed to stand for over thirteen hours, and the whey drawn off.

731,450. Robert A. Hatfield, Sheffield, England. **Toughening manganese steel.** Heat the steel slowly to 750° C., raise quickly to 940° C., increasing the temperature above said limits the tougher and less hard the desired product, and plunging the hot steel in cold water.

731,460. Adolf Israel and Oscar Dressel, Elberfeld, Germany. Assignors to Elberfeld Co., New York, N. Y. **Blue violet azo dye.** Chlor-*p*-phenylenediamine is combined with 1-8 dihydroxynaphthalene 3-6-disulphonic acid, containing the chlorine atom in meta-position to the azo group. The sodium salt is a gray-black powder soluble in water red-violet, turning red by ammonia, caustic soda or sulphuric acid, soluble in concentrated sulphuric acid 66° Beaume, red-violet changed to yellow by ice, more ice precipitates yellow flakes, dyeing wool from acid baths blue-violet.

731,461. Alfred K. Jarecki, Sandusky, Ohio. **Fertilizer.** Waste beet sugar refuse syrup and organic refuse is mixed with acid as sulphuric and a basic phosphate, allowing the mixture to stand till the heat of reaction has driven off all the moisture, leaving a dry granular fertilizer.

731,521. Henrietta D. Sudman, Boyne, Mich. **Detergent.** Rain water 520, shaving soap 5, borax 2, ether and alcohol each 16, glycerol 8, ammonia 16, essence of wintergreen 4, and chloroform 2 parts.

731,563. John C. Haley, Washington, D. C. Assignor one-half to Pennie, Goldsboro and O'Neill, Washington, D. C. **Soluble cocoa.** The cocoa is melted, the oil removed by glycerol, emulsified with syrup and added to the rest.

731,578. Rene Koehler, Lyons-Monplaisir, France. Solid soluble **antiseptic.** Trioxymethylene 95, and sodium sulphite 5 parts.

731,590. Charles W. Merrill, Alameda, Cal. **Cyanide leach** for ores. These are treated with hypochlorites of alkaline earths or of alkalies, and then with solutions of cyanides of alkalies or alkaline earths.

731,608. William Owen, Woking, England. **Artificial stone.** Eighty-five parts of 40-mesh sand are mixed with 15 parts 75-mesh lime, steamed at low pressure to slake the lime, then heavily pressed and dried, then saturated with moisture and carbon dioxide, and then cutting off the moisture till thoroughly hard.

731,631. Joseph T. Terry, Jr., Altar, Mexico, assignor one-half to J. D. Treanor, same place. **Extracting gold or silver** from slimes. Water is mixed with slimes to make a sludge which is sprayed onto the surface of a cyanide solution, allowing it to percolate through, and settle at the bottom without agitation, and decanting the clear liquid.

731,652. George J. Atkins, Tottenham, England. Generating **acetylene gas.** Calcium carbide and sodium carbonate or sulphate are ground and mixed together in a closed receptacle, and the residues are used to make soap.

731,653. John Ayling, Toronto Junction, Canada. **Firebrick.** Hard coal ashes 6, shale 3, and fire-clay 1 part.

731,660. Edwin Bennett, Mill Village, Pa. **Paint.** Gums dammar, shellac, tragacanth and glue, 1 part each, and beeswax, paraffin wax and rosin, 2 parts each, are mixed with ground shell rock, oil and color as required.

731,669. Edward Cullman, Buffalo, N. Y. Assignor to Schoelkopf, Hartford & Hanna Company, same place. **Green sulphur dye.** A mixture of *p*-aminophenol and aminoazobenzene chloride is boiled with sodium sulphide, sulphur and a copper salt, the product nearly insoluble in aqueous sodium carbonate but soluble in sulphuric acid with a dark color.

731,670. Walter Dollfus and Rudolph Hagenbach, Hochst-on-Main, Germany. Assignors to Farbwerke, vorm. Meister Lucius und Bruning, same place. **Yellow azo dye.** Diazotized *o*-amino-*p*-sulphobenzoic acid is combined with phenylmethyl pyrazolone, forming a yellow powder difficultly soluble in cold water easily soluble in hot and suitable for color lakes.

731,723. Gustav Tischel, Odessa, Russia. **Varnish.** Ground sticklac 140, white bleached ground shellac 20, French colophony

3, gum benzoin 8 from Sumatra, 5 of same from Siam, camphor 8, carnelian 15, sulphuric ether 12, alcohol which may be methylated, 1000 parts. All solids ground.

731,746. Augustus Bischler, Basle, Switzerland. Assignor to Basle Chemical Works, same place. **Sodium oxide.** Sodium peroxide is heated with sodium and a small per cent. of caustic alkali to above 400° C., *in vacuo* at the end of the operation.

731,758. Carl Daub, Antwerp, Belgium. Assignor one-half to Julius C. Deuther, Detroit, Mich. Apparatus for making **sulphuric anhydride.** The contact material is divided up in small boxes arranged in superposed horizontal courses in the contact chambers, and with suitable connecting pipes and means for heating, the different boxes containing contact material of varying strength.

731,831. Carl P. H. Ahrle, Frankfort-on-Main, Germany. Assignor to Metalline-Platten Gesellschaft, same place. A metallic plate is varnished, then coated with a mixture of albumin 16, honey 9, and water 23 parts, then covered with bronze powder and finally with a layer of hardened gelatin, and a layer of sensitized emulsion.

731,839. Gustavus A. Bahn, Austin, Texas. Sulphuric acid process of **extracting precious metals.** Cyanide solutions of the metals are first made, then acidified with sulphuric acid, and zinc in some form immersed in the mixture, whereby the metals to be separated are precipitated, dried and melted.

731,849. Abram L. Bower, Boyertown, Pa. Compound used in **capping tooth pulp.** Thymol is melted and oxide of zinc mixed in.

731,906. August Huck, Ludwig Fischer, Hermann Ahrle, and Emil Schmieder, Frankfort-on-Main, Germany. Assignors to Metalline-Platten Gesellschaft, same place. **Metalline films.** A rigid base is coated with caoutchouc, then with grease, then caoutchouc again, then japan, then a solution of albumen, honey and water, and while still wet a dry metallic powder is brushed on, dried, treated with alcohol and the completed film stripped from the plate.

731,943. William D. Perkins, Oil City, Pa. Assignor six-sevenths to G. B. Aten, F. M. Thompson, J. H. Aten, Laura B. Wade, T. A. McIntosh and J. M. Kerr, Wellsville, Ohio. **Apparatus for distilling petroleum.** A combination of an extended series of vaporizers, heaters, condensers and connecting pipes adapted for continuous fractional distillation at specified temperatures.

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732,047. Wm. R. Chipman, New York, N. Y. Alloy for

electrode. Aluminum 40, Straits tin 50, and nickel 15 parts and a suitable flux.

732,090. Ivan and Herbert Levinstein, Manchester, England. Assignors to Levinstein Limited, same place. **Blue sulphur dye.** *o*-Chlor-*p*-amino phenol and monalkyl-*o*-toluidine are mixed and oxidized to indophenol; this is reduced to a white powder sparingly soluble in benzene but which turns blue on exposure to the air, and which is heated with sulphur and alkaline sulphide to form a blue dye soluble in concentrated sulphuric acid blue, in caustic soda red-violet, and dyeing unmordanted cotton bright blue shades fast to light and washing.

732,103. Benjamin C. Mudge, Lynn, Mass. **Preparing flax.** The rough flax is steeped in a weak solution of caustic soda, then in a weak bleaching-powder solution, and again with weak alkali and blued with aniline blue.

732,143. Abram H. Van Riper and Patrick F. Guthrie, Nutley, N. J. **Fire extinguishing.** A stream of water is forced through a confined body of crystals of sodium hyposulphite, forming a solution of about 1.75° Beaumé which the fire immediately decomposes to sulphur and sodium sulphite that absorbs the surrounding oxygen.

732,159. Edgar F. Billings, Boston, Mass. **Formaldehyde generator.** A candle is enclosed in a case and a solid vaporizable compound of formaldehyde fixed above it, the whole forming an article of manufacture destroyed in using.

732,189. Max Jolles and Leon Lilienfeld, Vienna, Austria-Hungary. **Photographic plate solution.** An alcoholic solution of the albuminous substance of grain containing a haloid salt of silver.

732,203. George A. Lowry, Boston, Mass. Apparatus for **carbonating liquids** of the style known as "Sparklet", a capsule of steel containing the carbon dioxide, and adapted to be pierced on the neck of the bottle enclosed in a jacket, the flask having a compressing cap and packing.

732,207. Henry C. Mitchell, London, England. **Boiler covering.** The inside of a semi-circular mold is lined with a mixture of powdered mica, sodium silicate and lead acetate and lime, a layer of flake mica is put on and a circular body rolled on it and a binding agent poured over.

732,226. Johann Senft, Vienna, Austria-Hungary. **Painting cement.** White lead 50, litharge 25, polishing varnish 6, bone glue 15, turpentine 5, potassium silicate 5, siccative 20, rock lime 30, and water to make 200 parts.

732,234. Charles G. Sudre and Charles V. Thierry, Paris, France. **Drying distiller's wash.** First as a thin sheet on a moving apron at 200° to 250° C., then raising the temperature to 500° C., air being excluded and the evolved gases condensed.

732,263-4-5-6-7-8-9. All to Martin P. Boss, San Francisco, Cal. Assignor to Hydrocarbon Smelting Company, of West Virginia. A **hydrocarbon furnace** in which the ore is fed by gravity down-sloping flues through oxidizing and reducing heat chambers with suitable pockets and regulated fuel and air supply.

732,323. Albert H. Stone, Boston, Mass. **Depilatory.** Quicklime is slaked with a hot solution of sodium sulphide and the liquid decanted.

732,410. Christian H. Homan, Christiana, Norway. **Silicon and aluminum** from aluminum silicates. Clay and aluminum both powdered are exposed to high heat in an electric or other furnace whereby aluminum oxide is obtained and the silicon wholly or partially reduced, and the products tapped off separately.

732,480. Knut C. Wideen, Brooklyn, N. Y. Assignor to Carbon Hydrate Chemical Company, same place. **Oxygen compounds from acetylene.** Acetylene is converted into ethylene by passing it through a solution of ammonium and chromium sulphate of the protoxide type, then passing the ethylene in rapid succession over heated *p*-bromisopropylbenzene, hot sodium, and thence into superheated steam, making $C_{10}H_{16}O$.

732,514. David Beazell, Brunswick, Ga. **Varnish.** Boil 13 parts raw linseed oil three minutes, add 8 parts melted rosin and boil three minutes, add 12 parts white Japan drier and boil three minutes, cool two minutes, add 1 part beeswax dissolved in half a part of alcohol, and 1 part turpentine and finally, when cool, 1 part benzine.

732,548. Emile Guillaume, Paris, France. **Column still.** The partitions are staggered from side to side and extend half way across the column so that the lower edges may be curved to direct a sheet of fluid against the side of the column.

732,563. Winfield S. Keyes, San Francisco, Cal. **Drying fruit.** Grapes are put in a tight chamber with calcium chloride and a vacuum produced to make raisins without a coating of sugar.

732,569. Albert Leisel, Peekskill, N. Y. Assignor to Table Oilcloth Company, New York, N. Y. **Cloth** and paper are united by a waterproof cement, the cloth being first coated on both sides with oil paint, thickest on the exposed surface.

732,574. Eugene C. May, Chicago, Ill. **Artificial fuel.** Garbage is crushed, 3 per cent. of calcium chloride added and the mass pressed, one-fifth part of a mixture of crude petroleum with 2.5 per cent. of potassium protoxide added, then 3 per cent. of coal-tar pitch and molding the same to fuel briquettes.

732,605. Gustav E. Thede, Havilah, Cal. **Leaching ores.** A mixture of the ore and a metallic oxide is treated with a cyanide solution containing hydrogen peroxide.

732,616. Charles F. Burgess and Carl Hambuechen, Madison, Wis. **Heating electrolytes.** The heat is supplied to the electrolyte by a separate circuit from that by which the electrolysis is performed.

732,639. Thomas B. Joseph, Mercur, Utah. **Extracting gold.** The ores are leached by aqueous potassium cyanide containing bromine, calcium hydroxide and barium peroxide.

732,640. Thomas B. Joseph, Salt Lake City, Utah. **Cement.** Calcined calcium sulphate, barium peroxide, arsenic acid, and ammonium chloride.

732,641. As above for **leaching process.** The aqueous solution is made from nitric and sulphuric acids, sodium chloride and hyposulphite, and potassium permanganate.

732,663. Omar A. Stempel, Lakeland, Fla. **Paint.** Powdered asphaltum and asbestos are placed on the surface to be protected and fused, a coat of asphalt alone having been first applied.

732,674. Joshua A. Bell and Lynn T. Leet, Montreal, Canada. Assignors to Composite Stone and Brick Co., of Delaware. **Artificial stone.** Pulverized sand and hydraulic cement are mixed and molded and steamed under pressure, then submerged in water, taken out and again steamed. WM. H. SEAMAN.

REVIEW OF AMERICAN CHEMICAL RESEARCH.

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WILLIAM A. NOYES, Editor.

GENERAL AND PHYSICAL CHEMISTRY.

A Revision of the Atomic Weight of Iron. II. The Analysis of Ferrous Bromide. BY GREGORY PAUL BAXTER. *Proc. Amer. Acad.*, **39**, 245–256.—Four determinations of the ratio $FeBr_2 : 2AgBr$ were made by oxidizing the former salt in dilute sulphuric acid solution with potassium dichromate, precipitating with silver nitrate, and weighing the silver bromide. In two of these, the ratio $FeBr_2 : 2Ag$ was also determined by weighing out the calculated amount of silver, and estimating the excess of silver or bromine (which was found to be nil) in the supernatant solution from the turbidity produced with silver nitrate and hydrobromic acid. The mean of the six values of the atomic weight so obtained, after correction for the minute quantity of sodium bromide present in the sublimed ferrous bromide used, is 55.871, while from the earlier analysis of ferric oxide 55.883 was obtained (this *Rev.*, **6**, 143). The density of ferrous bromide at 25° was found to be 4.636. The effect of the earth's magnetism on the weight of a sample of metallic iron was shown to be negligible in even the most precise atomic weight work. A. A. NOYES.

The Colors of Allotropic Silver. BY J. C. BLAKE. *Am. J. Sci.*, **166**, 282–288; *Ztschr. anorg. Chem.*, **37**, 243–251.—The author concludes that all the color effects that have been observed may be explained by the assumption of three forms, "white silver," "blue silver," and "red silver," and perhaps a fourth form, "yellow silver," which differs from red silver only in forming a yellow mirror on glass. Blue silver is blue by transmitted and golden-yellow by reflected light. Red silver is red by transmitted, and indigo-blue by reflected light. These two varieties alone form stable colloidal solutions. The conditions of formation and transformation into each other of the separate forms are described; and a table is given showing the results of the reduction of silver solutions by a large number of reducing agents. A. A. Noyes.

On Colloidal Gold: Adsorption Phenomena and Allotropy. By J. C. Blake. *Am. J. Sci.*, **166**, 381–387.—A very stable and concentrated red colloidal gold solution was made by pouring an ethereal solution of gold chloride dried at 170° into a solution of acetylene in water. When such gold solutions are precipitated by barium chloride, the precipitate contains scarcely any barium, if the liquid is even slightly acid, but a large quantity of it, if the solution be made alkaline by the addition of barium hydroxide. The author concludes that adsorption phenomena are not concerned in an important way in the color effects produced in gold solutions by electrolytes. He distinguishes three allotropic forms of gold—yellow gold, blue gold, and red gold.

A. A. Noyes.

On the Heat of Combustion of Hydrogen. By W. G. Mixter. *Am. J. Sci.*, **166**, 214–228.—The author has made, in a silver calorimetric bomb, fourteen determinations of the heat of combustion of hydrogen prepared from sodium hydroxide solution and aluminium or zinc. Every precaution seems to have been taken and all corrections of importance applied. The weighted mean derived from these experiments is 33,993 calories-at-20° for the heat of combustion of one gram of hydrogen at constant pressure with formation of liquid water at 0°. The values previously obtained by Thomsen, Schuller and Wartha, and Than, are 34031, 34009, and 34061 respectively. The final mean from these four independent series is 34020, the error in which is probably not more than 0.1 per cent. For one mol (2.016 grams) the heat of combustion at constant pressure at 0° is 68580, and at 18° is 68440 calories-at-20°. A. A. Noyes.

The Association of a Liquid Diminished by the Presence of Another Associated Liquid. By Harry C. Jones and Grantland Murray. *Am. Chem. J.*, **30**, 193–205.—The authors have determined the freezing-point lowering produced by dissolving separately acetic acid and formic acid in water, water and acetic acid in formic acid, and water and formic acid in acetic acid. The measurements extended from below molar up to 6- to 9-fold molar. The molecular weight was calculated by means of the constants applicable to dilute solutions. The values so obtained all increase with increasing concentration, but in no case (excepting that of water in acetic acid where the calculated molecular weight became 38 in 12-fold molar solution) do they exceed the normal one by as much as 45 per cent., even at the highest concentration. From this fact and the surface-tension values of Ramsay and Shields, the authors conclude that the dissolved substances are all much less associated in the mixture than in the pure state.

The increase in apparent molecular weight was least with water as the solvent, greater with formic acid, and greatest with acetic acid, in correspondence with the well-known relative dissociating powers of these solvents. From their experiments and the parallelism between the molecular association of liquids and their dissociating powers, the authors conclude that mixtures of liquids have a less dissociating power than the components separately, and explain in this way the results of Jones and Lindsay (*this Rev.*, **9**, 260), who found that the conductivity of electrolytes in mixtures of methyl alcohol and water is less than even in pure methyl alcohol. This last fact is due, however, as previously pointed out by the reviewer, mainly to a decrease in the migration velocity: that there is also a marked decrease in the dissociation was not shown by Jones and Lindsay. A. A. NOYES.

The Lowering of the Freezing-Point of Aqueous Hydrogen Dioxide by Sulphuric and Acetic Acids. BY HARRY C. JONES AND GRANTLAND MURRAY. *Am. Chem. J.*, **30**, 205–209.—In continuation of previous investigations (*this Rev.*, **8**, 265; **9**, 250), it is found that sulphuric acid lowers the freezing-point of a 4.7 per cent. solution of hydrogen peroxide in water 10–20 per cent. more, and that of a 9.5 per cent. solution 25–40 per cent. more, than it lowers the freezing-point of pure water; and that acetic acid exhibits the same phenomenon, but in much slighter degree. This is attributed to an increase in the dissociation of the acids by the peroxide, but it may well be due to other causes.

A. A. NOYES.

On a Determination of the Freezing-Point Depression Constant for Electrolytes. BY THOS. C. HEBB. *Trans. Nova Scotian Inst. Sci.*, **10**, 409–421.—By making further application of the indirect, inverse method of MacGregor (*this Rev.*, **8**, 439), the author has studied the extent of the agreement of the observed molar freezing-point depression (δ) of electrolytes with that calculated from the conductivity ratio (α) and the depression-constant. The method consists in determining, by means of plots based on the separate series of freezing-point and conductivity data thus far published, the values of the constants k and l occurring in the equation $(\delta)=k(1-\alpha)+l\alpha$. These constants should, of course, have the value 1.86 (or the appropriate multiple thereof), if the theoretical requirements are fulfilled. In fact, it is found that the mean value of l (divided in each case by the appropriate integer) derived from 37 series of freezing-point measurements with 13 different electrolytes is 1.851, and that of k, which is much more affected by the experimental errors, is 1.932. The average deviation of 31 separate values of l from the mean (six very widely divergent ones being omitted) is 0.9 per cent. Thus the highly important question, does the conductivity method of determining dissociation give results agreeing with those obtained by other standard methods, again receives from this comprehensive study, an affirmative answer. One still feels, however, that a more critical comparison carried out by a more direct method and supplemented by new determinations where apparently needed, is very desirable.

A. A. NOYES.

On the Determination of the Freezing-point Depressions of Dilute Solutions of Electrolytes. BY THOMAS C. HEBB. *Trans. Nova Scotian Inst. Sci.*, **10**, 422–432.—The results are presented of twenty-two very careful determinations (made when the temperature of the surrounding air was 0°) of the freezing-point of potassium chloride solutions of concentrations varying from 0.004 to 0.074 molar. The molar depressions at 0.01–0.03 molar are about one per cent. higher than those of Jones and of Loomis, while at 0.074 molar the agreement with that of Jones is complete and with that of Loomis is within 0.7 per cent. The quotients of the molar depression by the number of molecules ($1 + \alpha$) present as calculated from Whetham's conductivity data at 0° were found to have the average value 1.85, and the greatest deviation from this value is one per cent. The results furnish a striking confirmation of the applicability of the perfect gas laws to this electrolyte and of the proportionality between electrical conductivity and dissociation in this case. A. A. NOYES.

The Toxic Effect of H and OH Ions on Seedlings of Indian Corn. BY FRED A. LOEW. *Science*, **18**, 304–308.—Potassium and sodium hydroxide solutions were found to kill corn seedlings at the same concentration (1/64 normal), and at smaller concentrations to permit about equal growth. Hydrochloric and sulphuric acids also caused death at the same concentration (1/256 normal), but the latter acid allowed much greater growth in the more dilute solution. The corn seedlings will live with a concentration of hydroxyl ions three times as great, but with one of hydrogen ions twelve times as great as will the seedlings of *Lupinus albus* previously studied by Kahlenberg and True. Unfortunately the author did not maintain the seedlings at a constant temperature during their growth. A. A. NOYES.

History of the Water Problem. BY J. W. MELLOR. *J. Phys. Chem.*, **7**, 557–567.—In this article attention is called to an essay published by Mrs. Fulhame in 1790, and portions of it are reproduced, in order to show that it was at that early date recognized that water was essential to the occurrence of many chemical reactions. A. A. NOYES.

Saturated Gypsum Solutions as a Basis for Conductivity. BY G. A. HULETT. *Ztschr. phys. Chem.*, **42**, 577–583.—The use of normally saturated gypsum solutions (see *this Journal*, **24**, 667) is recommended for the determination of the resistance-capacity of conductivity cells. These solutions are prepared by circulating, by means of a stirrer, pure conductivity-water for three hours or more over plates of pure native gypsum in an Erlenmeyer flask kept in a thermostat. The author's experimental determinations lead to the following equation as an expression of the specific conductivity, κ, in reciprocal ohms, of a gypsum solution saturated in this way at any temperature t between 10° and 30°:

$$10^6\kappa = 2208 + 45.6\,(t-25) + 0.163\,(t-25)^2.$$

Determinations of the molar conductivity of calcium sulphate solutions at ten dilutions between 65.5 and 33,500 liters per mol are also presented, the values at these two limits being at 18°, 126 and 234 respectively. For infinite dilution the value adopted is 240 which corresponds to 104 for the calcium ion. Incidentally is suggested a modification of the Arrhenius cell, consisting in a conical-shaped bottom in which the lower electrode fits closely, thus preventing any change in the position of the electrodes in the cell. This would seem to have the disadvantages of reducing the electrode surface and of increasing the danger of slightly bending the lower electrode. A. A. NOYES.

Solubility of Calcium Sulphate in Aqueous Solutions of Sulphuric Acid. BY F. K. CAMERON AND J. F. BREAZEALE. *J. Phys. Chem.*, **7**, 571–577.—The solubility in grams per liter is found to increase at 25° from 2.13 in pure water to a maximum of 2.84 in 0.75 molar solution of sulphuric acid, and then to decrease to 1.54 in three-fold molar solution. At 43° it increases from 2.15 in pure water to a maximum of 4.26 in 1.07 molar sulphuric acid, and then decreases to 2.48 in three-fold molar solution. The increase of solubility indicates that the common ion effect is overcompensated by the formation of some complex molecules or ions. The explanation suggested by the authors to the effect that complex ions like $Ca(SO_4)_2''$ and $HCa(SO_4)_2'$ may be present, seems the most probable one.

Especial attention is called to the fact that the solubility value at 25° (2.126 grams per liter) is considerably greater than that (2.080) obtained by Hulett and Hulett and Allen (*this Journal*, **24**, 667; *Ztschr. phys. Chem.*, **37**, 385; **42**, 577), by circulating water over plane surfaces of gypsum. Yet the former value was always obtained by the authors, even with calcium sulphate from widely different sources and in various physical conditions, and they consider that their value is the true solubility as ordinarily determined with particles of moderate size. A. A. NOYES.

The Solubility of Magnesium Carbonate in Aqueous Solutions of Certain Electrolytes. BY F. K. CAMERON AND A. SEIDELL. *J. Phys. Chem.*, **7**, 578–590.—Great difficulty was met with in obtaining concordant values for the solubility of this salt; and consequently the results presented are only rough approximations. The solubility in sodium chloride solutions through which ordinary air not freed from carbon dioxide is bubbled, rapidly increases with the concentration till this reaches 10 per cent., after which it decreases. On the contrary, when kept saturated with carbon dioxide, all chloride solutions dissolve less magnesium carbonate than water does, the decrease in solubility being 70 per cent. in a nearly saturated sodium chloride solution. This is considered irreconcilable with the Ionic Theory; but it may well be due to the decrease of solubility of carbon dioxide itself in the strong salt solution. In solutions of sodium sulphate saturated with carbon dioxide, the solubility first increases, but not very largely, to a maximum, and then somewhat decreases. When the solutions were saturated in closed bottles originally free from carbon dioxide, the solubility in sodium chloride was found first to increase to a maximum and then to decrease, with increasing concentration; while with sodium sulphate and carbonate a regular increase occurs up to the highest concentrations. The solubility in double molar sodium carbonate solution is nearly tenfold that in water, which indicates the formation of a complex carbonate. A. A. NOYES.

The Changeable Hydrolytic Equilibrium of Dissolved Chromic Sulphate. BY THEODORE WILLIAM RICHARDS AND FREDERIC BONNET, JR. *Proc. Am. Acad.*, 39, 330.—The authors have worked upon the problem of the violet and green chromium solutions. They come to the same conclusion as previous investigators that hydrolysis of the normal violet salt is the cause of the color change, and that this hydrolysis is, in general, not complete. The dependence of the extent and speed of the hydrolysis upon the temperature was determined by measuring the rate of the inversion of sugar under the influence of the various solutions. Migration experiments indicate that there is no anion containing chromium in the green solution, but that there is a cathion of a green color (perhaps $Cr(OH)_2$). The acid set free by this hydrolysis seems to be sulphuric acid, and not a complex acid. Its removal by shaking with a mixture of alcohol and ether or by digesting with chromic hydroxide was found to accelerate the hydrolysis. Excess of acid accelerates the reversion to the violet salt and retards the formation of the green salt. A bibliography of the work that has been done upon this color change accompanies the article.
C. S. HUDSON.

On the Thiocyanates of Silver and Potassium and Their Solubility. BY H. W. FOOTE. *Am. Chem. J.*, 30, 330–339.—In order to determine the existence of stable double salts, the author makes use of solubility experiments in which the composition of the residue is varied and the resulting effect upon the composition of the saturated solution is determined. Weighed quantities of potassium thiocyanate, silver thiocyanate, and water were allowed to reach equilibrium at 25° and a portion of the solution was then analyzed. As none of the salts involved form hydrates, the analysis of the solution sufficed also to determine the composition of the residue. To illustrate the method, the results obtained are given in the following table :

Expt. No.	Per cent. KSCN in solution.	Per cent. AgSCN in solution.	Per cent. KSCN in residue.	Per cent. AgSCN in residue.
1	70.38	....	100.00	....
2	66.44	9.46	87.95	12.05
3	66.80	8.95	74.29	25.71
4	66.42	9.56	55.25	44.75
5	64.47	10.62	53.38	46.62
6	61.25	11.76	53.97	46.03
7	58.34	13.55	54.23	45.77
8	53.21	17.53	54.14	45.86
9	50.55	20.46	49.12	50.88
10	50.81	20.40	43.98	56.02
11	49.43	20.32	36.58	63.42
12	32.51	18.34	36.75	63.25
13	24.68	16.41	36.26	63.74
14	23.89	16.14	32.83	67.17
15	23.83	16.01	24.66	75.34

In the above table, No. 1 represents the solubility of pure KSCN. Nos. 2, 3 and 4 show a constant solubility while the composition of the residue changes, indicating that a mixture of KSCN and a double salt are present as solid phases. Nos. 5, 6, 7 and 8 show a constant composition of the residue while that of the solution changes : here the first double salt which is evidently 2KSCN.AgSCN appears in pure condition. Nos. 9 and 10 show a constant solubility and variable composition of the residue corresponding to a mixture of 2KSCN.AgSCN and the next double salt. Nos. 11, 12 and 13 show variable composition of the solution while the residue corresponds closely to KSCN.AgSCN. Nos. 14 and 15 have a constant composition of the solution while the residue varies, corresponding to a mixture of KSCN.AgSCN and AgSCN.

The salt 3KSCN.AgSCN isolated by Wells and Merriam (*Am. Chem. J.*, **28**, 265) is unstable at ordinary temperatures, breaking down into 2KSCN.AgSCN and KSCN. In order to determine whether a transition temperature in the case of this salt is to be expected at high or at low temperature, the author attempts to determine the heat of transition of 3KSCN.AgSCN into 2KSCN.AgSCN + KSCN by measuring the heats of solution in one case of the single salt, and in the other case of the mixture. The reviewer would, however, emphasize the fact that the heat of transition can be determined in this way only in case a freshly prepared solution of 3KSCN.AgSCN is identical with a freshly prepared solution of 2KSCN.AgSCN + KSCN, in other words in case the equilibrium in solution is immediately established. Whether the reaction in question takes place quickly or slowly is not known. C. S. HUDSON.

On the Double Caesium and Mercuric Chlorides and Their Solubility. By H. W. Foote. *Am. Chem. J.*, 30, 339–344.—By the method described in the preceding review the following stable double chlorides of caesium and mercury were shown to exist at 25°: $3CsCl.HgCl_2$, $2CsCl.HgCl_2$, $CsCl.HgCl_2$, $CsCl.2HgCl_2$, $CsCl.5HgCl_2$. Other stable combinations of the two salts at 25° are excluded, because the differences in composition of the solutions and residues from group to group are slight. C. S. Hudson.

The Solubility-Curve of Sodium Tetraborate. By D. W. Horn and Elizabeth M. Van Wagener. *Am. Chem. J.*, 30, 344–350, 1903.—The curve is composed of two branches referring to the deca- and penta-hydrates respectively. The transition temperature for the two forms is about 60°, but the determination is not sharp on account of the unusually small change of direction of the solubility curve at the transition temperature. The dilatometer or the tensimeter would probably have given a sharper determination. The values of the solubility from 5° to 100° are also given. C. S. Hudson.

The Rates of the Reactions in Solutions Containing Ferrous Sulphate, Potassium Iodide, and Chromic Acid. By Clara C. Benson. *J. Phys. Chem.*, 7, 356–388.—The rates of oxidation of ferrous sulphate and of potassium iodide, each taken separately, by a mixture of potassium dichromate and sulphuric acid, were recently investigated by the author (*this Rev.*, 9, 252) and by De Lury (*this Rev.*, 9, 501), respectively. The author now determines the rates of their oxidation by chromic acid in solutions containing both salts simultaneously, and finds that the rate of liberation of iodine is proportional to the 1.3th to 1.6th power of the concentration of the bichromate, to the fourth power of that of the acid, to the first power of that of the ferrous salt, to the first (or less) power of that of the iodide, and that the oxidation is much retarded by ferric salts; on the other hand, the rate of oxidation of the ferrous sulphate is found to be proportional to the first power of the concentration of the ferrous salt, to the third or fourth power of that of the acid, and to the first power of that of the bichromate, and to first decrease and then increase with increasing concentration of the iodide.

In order to account for the marked differences in the order of the reactions in solutions containing both potassium iodide and ferrous sulphate and in those containing these salts separately, the author assumes that in these solutions a new reaction, the oxidation of the ion FeI^+, takes place. C. S. Hudson.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

The Clays of the United States East of the Mississippi River. By Heinrich Ries. *U. S. Geol. Survey, Professional*

Paper No. 11, 298 pp.; maps, plates, figs.—The title sufficiently indicates the scope and character of this important report, which is replete with typical analyses. W. F. HILLEBRAND.

The Rossie Lead Veins. BY C. H. SMYTH, JR. *School of Mines Quarterly*, **24**, 421–429.—These veins, so noted for the fine specimens of calcite, galena, and pyrite which they produced in the early half of the past century, are of no present commercial value, though still of interest otherwise. The author has reëxamined them, and in the light of his observations and their known history offers suggestions as to the source of the vein contents. These, it is thought, may have come upward from crystalline limestones that exist in the vicinity and perhaps underlie the veins. W. F. HILLEBRAND.

The Geology of the Cerrillos Hills, New Mexico. Part I, General Geology (continued). BY D. W. JOHNSON. *School of Mines Quarterly*, **24**, 456–500; map, plates.—Two points of interest to the chemical geologist in this paper are to be noted. The formation of bituminous coal and true anthracite from lignite seems to be clearly traced to the effect of intruded lava sheets without actual contact. Indeed, when this occurred, the coal was destroyed, whichever one of the three it might be. "More gradual thermal action through intervening protecting beds of sand and shale was conducive to the production of the best grade of coal." With respect to the origin of the well-known turquoise of this region, the author disagrees with the views of Clarke and Diller (1887) and Herrick (1900), and attaches greater weight to that of Silliman (1880). The latter supposed the aluminum and phosphorus to be derived from the feldspar and apatite of the adjacent andesite by the action of heated vapors, while Clarke and Diller imagined a replacement of preexisting veins of apatite. The latter mineral occurs in the fresh rock in abundance, but is missing from the altered portions that bear the turquoise. The copper of this mineral "was probably supplied from the same copper-bearing solutions, possibly indirectly, which gave rise to the copper-bearing ores of the region."
W. F. HILLEBRAND.

The Ore Deposits of Tonopah, Nevada (Preliminary Report). BY J. E. SPURR. *U. S. Geol. Survey Bull. No. 219*, 61 pp.; map, figures. Strictly chemical matter is wanting and a review will be deferred until the appearance of the full report.
W. F. HILLEBRAND.

Mineral Analyses from the Laboratories of the United States Geological Survey, 1880 to 1903. TABULATED BY F. W. CLARKE. *U. S. Geol. Survey, Bull. No. 220*, 119 pp.—Herein are brought together, in classified order, 507 analyses of minerals made by the chemists of the survey since its organization. Over

150 distinct species are represented, and not a few of the analyses are now published for the first time. Detailed descriptions are omitted, but references to original publications are given.

W. F. HILLEBRAND.

ANALYTICAL CHEMISTRY.

The Morse Apparatus for Gauging Temperatures. *Iron Age*, October 22, 1903.—Description of a practical form of pyrometer, now being sold, in which an incandescent filament is heated by a storage battery current to a desired degree, and then observed against the furnace as a background. The arrangement is practical, and it is stated that temperatures can be determined to within 5° F.

J. W. RICHARDS.

Analyses and Fuel Value of Coal. BY F. HAAS. *Mines and Minerals*, September, 1903 (from Vol. II, Report W. Va. Geological Survey).—Analyses, giving moisture, volatile matter, fixed carbon, ash and sulphur of 51 "Pittsburg" coals from the Fairmount Region of West Virginia, with the calorific power of each. The calorific power was found to be calculable from the analysis by the following formulae:

Calorific power (B. T. U. per 100 pounds) $= 15,675$ (100 — per cent. ash — per cent. sulphur — per cent. moisture) $+$ (4,050 $\times$ per cent. sulphur).

Calorific power (Cal. per 100 kilos) $= 8,710$ (100 — per cent. ash — per cent. sulphur — per cent. moisture) $+$ (2,250 $\times$ per cent. sulphur).

The results of calculation agreed with the experimental results always within 1 per cent., and averaged to within 0.5 per cent. Complete analyses of the ash of seven of these coals are also given.

J. W. RICHARDS.

METALLURGICAL CHEMISTRY AND ASSAYING.

Metal Spinning. BY W. GOODWIN. *Metal Industry*, October, 1903.—Attention is called to the fact that most of the dictionaries and encyclopedias ignore this art, not even defining it. High brass and Britannia are the metals most largely spun, but low brass, copper, sheet zinc, sheet tin, German silver, sheet steel, lead, aluminum, nickel, silver, gold, platinum and various alloys, can be spun with proper manipulation. Copper requires about the same treatment as brass. Aluminum, either pure or alloyed, can be spun easily; it is annealed at a temperature which will char a pine stick. Sheet zinc is troublesome, and must be spun warm to give good results; the annealing is difficult. Good steel may be spun into any plain shape not too deep; soap is a good lubricant to use. Oval spinnigs are made on an ordinary lathe with an oval or eccentric attachment on the head stock.

J. W. RICHARDS.

The Use of Shrink Balls on Patterns. By E. S. Sperry. *Metal Industry*, September, 1903.—Patterns must be adapted to the metal to be cast. The majority of failures in casting strong bronzes are on account of improperly made patterns. All the bronzes of high tensile strength for sand castings contain aluminum, the success of manganese bronze, for instance, dating from the introduction of 0.5 to 1.0 per cent. of aluminum into it, this giving it sound sand-casting qualities. In making these castings, the light portions draw away from the heavy in cooling, producing either cracks or shrinkage depressions. In large work this is obviated by heavy risers; or by placing shrink balls on any part, heavy or light. The moulder should make a pattern to the best of his ability, then cast some samples from it, and observe where shrinkage holes appear. These can then be remedied by placing shrink balls in convenient positions so as to feed the casting at these places, during cooling. J. W. Richards.

The Use of Salt in Melting Brass. By E. S. Sperry. *Metal Industry*, October, 1903.—In melting copper, its property of oxidizing and dissolving its own oxide, renders the manufacture of copper alloys difficult to carry out uniformly. If copper could be melted without oxidation, the brass resulting would be perfect in quality, assuming the copper and zinc of good quality. In melting copper, the use of charcoal prevents this oxidation, but the necessity for the total elimination of oxygen is much greater in making brass. To accomplish this object, both charcoal and salt are used in the brass industry. The salt, according to Mr. Sperry, does not act as a simple air-excluding covering, but reduces metallic oxide dissolved in the bath. The best results are obtained by using enough salt to make a slightly viscous slag. The copper is covered with charcoal, several handfuls of salt added as it melts, more salt added when it is melted, and then the zinc introduced. The salt does not act appreciably on the crucible, and is cheap, so that it has decided advantages over borax, glass, soda ash, etc. J. W. Richards.

Dipping Zinc. By F. P. Davis. *Metal Industry*, October, 1903.—The best solution is made by mixing equal parts of nitric acid and sulphuric acid, and adding one per cent. of common salt. The solution is allowed to cool before using. The articles are cleaned from oil and grease, dipped a few seconds, then rinsed in water. Articles for electro-plating are not directly immersed in hot caustic potash solution, as its activity is too strong; grease is removed by washing in benzine and drying in sawdust. Then dip quickly in potash solution, rinse immediately with water, pass through the cyanide solution, and place at once in the plating bath. J. W. Richards.

Tin Ore in Texas. *Iron and Mach. World*, October 10, 1903.—

Tin ore was found in 1899 on the east slope of the Franklin mountains, 12 miles north of El Paso. It occurs in well-defined fissure veins, from 2 to 5 feet wide, which have been traced on the surface for 1200 feet. The rock is a coarse red granite. They resemble the Cornwall veins. An exhibit of these ores will be made at St. Louis, and development work is in progress.

J. W. RICHARDS.

The Quicksilver Deposits of Oregon. BY W. B. DENNIS. *Eng. Min. J.*, October 10, 1903.—The world's output of mercury is steadily diminishing in spite of an increased demand. Cinnabar was first found in Oregon as a heavy red sand clogging the riffles in washing for gold. Many collected it, and distilled from it enough mercury for their own use. On the northwest slope of Siskiyou Peak, cinnabar occurs in fine crystals in a gangue of granular calcite; in the northern part of Douglas County the Elkhead mine has produced $30,000 worth of mercury, using a 10-ton Scott continuous furnace, erected in 1895. The ore has been mined in the coast range. The Black Butte district contains two mines, at one of which a 50-ton Scott furnace is operated. The vein is exposed 1600 feet on the nearly vertical face of the Black Butte, allowing mining of the ore at $1.40 per ton. The outcrop gives an immense body of low-grade ore, exposed for 7,500 feet. The entire fissure, 400 feet wide, is cinnabar-bearing.

J. W. RICHARDS.

Magnetite Deposits. BY H. REIS. *Mines and Minerals*, September, 1903.—An account of the deposits at Mineville, N. Y., and their exploitation. The immense body of ore carries about 64 per cent. of iron and 1.6 per cent. of phosphorus. Wetherill magnetic separators reduce the phosphorus to 0.8 or 0.5 per cent. The standard type of concentrator has one to three pairs of magnets, wound with 6,000, 4,000 or 3,300 turns. The current is employed at 110 volts, and the amperes 5, 15 or 30 for the three magnets, respectively, giving 30,000, 60,000 and 100,000 ampere turns, respectively. The capacity of the machines is up to 6 tons each per hour. The high phosphorus in the concentrates makes them suitable for only special kinds of pig iron.

J. W. RICHARDS.

The Magnetic Concentration of Iron Ore in New Jersey. *Iron Age*, October 22, 1903.—Description of results being obtained in the plant erected at Hibernia, N. J., for Mr. Joseph Wharton, by C. M. Ball. The plant has already been described in these abstracts. It was started in May, 1903, and has been successfully operated since. The average crude ore contains 47.6 per cent. of iron, the coarse concentrates 58.2 per cent., the fine concentrates 54.61 per cent., and the tailings 23.55 per cent. Since the hornblende gangue carries 7 to 8 per cent. of iron, the iron contents in the tailings is not all magnetic iron ore. An improvement by Mr. Ball, now in course of being introduced, will, it is claimed, increase the iron in the concentrates to over 60 per cent., and reduce that in the tailings to less than 15 per cent.

J. W. RICHARDS.

Steel for Third Rails. BY J. A. CAPP. *Iron Age*, October 29, 1903 (read before Am. Inst. Mining Eng.).—The strength of the section of these conductor rails is of little importance; what is required is sufficient surface from which the powerful current may be collected, and an ample cross-section and good conductivity, so as to carry the current without undue drop of potential. For low resistance, manganese must be present in very small quantities, much smaller than is usual in merchant or structural steel. The resistance should not be over eight times that of copper, and the following *extremes* of composition are permissible: Carbon up to 0.2 per cent., manganese up to 0.4 per cent., phosphorus up to 0.06 per cent., sulphur up to 0.06 per cent., silicon up to 0.05 per cent. No third rail should reach all those extremes, and the composition recommended is that the following properties be not exceeded in a given rail: Carbon, 0.15; manganese, 0.30; phosphorus, 0.06; sulphur, 0.06; silicon, 0.05.

J. W. RICHARDS.

Alloys Used for Steel Making. BY DR. J. OHLY. *Mines and Minerals*, October, 1903.—The alloys used are divided into two classes, *viz.*, compound builders and reducing agents; the former includes those used to make special steels, such as contain Ni, Cr, Co, Cr and Ni, W and Ni, W, P, Mo, Mo and Ni, Ti, V, B, Mn, V; the latter includes those used to remove oxides from the metal, and contain Al, Na, Si, or Cu and Si. The metals which tend to form nitrides, and therefore to remove dissolved nitrogen from steel are Ni, Cr, Co, W, Mo, Ti, V and B, forming respectively Ni_3N, Cr_3N, Co_2N, WN, MoN or Mo_3N_2, TiN_2, VN or VN_2, BN. These nitrides, once formed, enter the slag. *Ferro-nickel* carries 25, 35, 50 or 75 per cent. of nickel, 0.75 to 1.00 per cent. of carbon, 0.20 to 0.30 per cent. of silicon, 0.01 to 0.02 per cent. of sulphur, and 0.02 to 0.03 per cent. of phosphorus. *Ferro-chrome* is manufactured by the Goldschmidt method or in the electric furnace. It carries usually 70 per cent. of chromium and sells at $200 per ton. Analysis of one sample showed chromium 64.05, iron 25.45, carbon 8.55, silicon 1.88, phosphorus 0.025, sulphur 0.046. *Ferro-cobalt* is a very recent alloy, giving alloys resembling nickel steel. 1.8 per cent. of cobalt makes a very tough, ductile steel.

J. W. RICHARDS.

Notes on the Microstructure of Steel. BY J. E. HOWARD. *Iron Age*, October 29, 1903.—The position of the microscope in the prominent steel works of this country seems generally to be a subordinate one, without an advancing tendency; some of the works have nearly or quite suspended actively using it. Steels subjected to 150,000,000 repetitions of alternate 40,000 pound stresses have been carefully examined, and no characteristic difference shown under the microscope from unstrained steel. Neither are the internal strains made by quenching from a temperature of 900° F. revealed by the microscope. Thermal cracks in steel seem to disregard its cellular structure, none of them following the microscopic network, as might have been expected. The author discusses similarly ductility, and fine grain, and concludes that metallography is not in such a state as to render implicit assistance to engineers in choosing structural steel. J. W. RICHARDS.

The Metallography of Iron and Steel. BY H. M. HOWE. *Eng. Mag.*, September, 1903.—An elementary presentation of the subject, condensed from the author's recent book on "Iron, Steel and Alloys." Clearness is in some cases sacrificed for brevity, and not many will agree with the statement that "the essential distinction between wrought iron and steel is that the former necessarily contains a small quantity of slag, which the latter lacks," or with the statement that "all cast irons are weak," without the explanation that the expression is meant to refer to tensile strength and not to compressive. The article will be useful to those wishing a very elementary presentation of the subject.

J. W. RICHARDS.

The Electrometallurgy of Iron. BY M. RUTHENBERG. *Electrochemical Industry*, October, 1903 (read before Am. Electrochemical Soc.).—A continuation of the work of this investigator, giving illustrations of his latest style of roll furnaces, in which the ore is sintered by electric heat. One ton of ore is now agglomerated with an expenditure of 250 kilowatt hours. The sintered ore drops into a soaking pit where carbonic oxide gas is passed through it and reduces it to the metallic state, its inherent heat furnishing all the heat necessary. The reduced ore is dropped from the bottom of the soaking pit into iron wagons and transferred to the hearth of an open-hearth furnace. The statement is made that considerable of the sulphur in the ore is eliminated in the sintering operation by the reaction of Fe_3O_4 on FeS_2, in absence of reducing action. J. W. RICHARDS.

On the Construction of Resistance Furnaces. BY F. A. J. FITZGERALD. *Electrochemical Industry*, October, 1903 (read before Am. Electrochemical Soc.).—A discussion of the theoretical considerations governing the design of this important class of furnaces. The resistance may be varied by adjusting the size of the core, or the forms of carbon and size of the pieces of which it is composed. Equations were given for the limiting cases which arise in practice. J. W. RICHARDS.

Electrolytic Copper Refining. BY W. D. BANCROFT. *Electrochemical Industry*, October, 1903 (read before Am. Electrochemical Society).—Results of a series of experiments carried out by the author, with Messrs. Schwab and Baum, to determine the most economical current density and temperature. Good adherent copper can be obtained at any current density, provided circulation is sufficiently active. With increasing current density the cost of power increases but the interest charge on the copper under treatment decreases. The ratios of power required as temperature is increased are, calling the power at 20° C. unity, 0.6 at 50° C., 0.45 at 70° C., and 0.35 at 90° C., using the ordinary refining solution. If the tank is heated by its own internal resistance to the current, 50 per cent. more power is required to keep a tank at 50° C. if uncovered, than if covered, 100 per cent. more at 75°, and 200 per cent. more at 90° C. Using covered tanks, the following estimates are made of the cost of refining one ton of copper, considering only the cost of power and interest on the copper under treatment.

Current density				
Amperes per square meter.	Amperes per square foot.	At 50° C.	At 70° C.	At 90° C.
200	18	$0.91	$0.83	$0.80
300	27	0.91	0.78	0.72
400	36	0.95	0.82	0.89

The conclusion drawn is that, as far as these items of cost are concerned, it is most economical to work with a current density of 350 amperes per square meter = 32 amperes per square foot, at a temperature of 70° C., and with covered tanks.

J. W. RICHARDS.

An Electrolytic Process of Removing Brass from Steel. BY C. F. BURGESS. *Electrochemical Industry*, October, 1903 (read before Am. Electrochemical Soc.).—In most electrolytes iron corrodes more readily than copper, but the problem is solved by using as electrolyte a sodium nitrate solution, in which iron, used as anode, assumes the passive state and is less readily attacked than copper. In such a solution, brass can be completely removed electrolytically and the iron left intact. The same method can be used to remove silver, lead, tin and other metals, but nickel cannot be so removed, since it also assumes the passive state.

J. W. RICHARDS.

Electrometallurgy of Gold. BY W. H. WALKER. *Electrochemical Industry*, October, 1903 (read before Am. Electrochemical Soc.).—A discussion of the electrolytic precipitation of gold from various single and double salt solutions, and a review of the electrochemical methods of extracting gold from its ores. The latter are divided into those in which solution and precipitation take place simultaneously, and those in which they occur successively. The first class have mostly failed on an industrial scale, because of the necessity of continuously moving the large quantities of ore treated. If the ore is brought, in these processes, into good contact with the cathodes, cathodic reduction of the gold compounds present, such as gold telluride, plays an important part in the success of the process, and that good contact with the cathode is, therefore, an essential requirement.

J. W. RICHARDS.

The Hendryx Process of Electro-Cyaniding. BY SPECIAL CORRESPONDENT. *Eng. Min. J.*, October, 31, 1903.—The process has already been introduced in Mexico, Arizona and California. It consists in grinding the ore to pulp, and feeding it into a very weak cyanide solution in a circular tank with funnel-shaped bottom. A propeller causes the solution to rise in the centre of the tank, and to pass over sloping lead-coated iron plates, at the top, which are electrically connected with suitable anode plates. The solution is used warm, and 80 to 96 per cent. extraction, on the plates, is claimed in 3 to 6 hours, even on ores carrying 1 to 3 per cent. of copper.

J. W. RICHARDS.

The Colorometric Estimation of Gold in Cyanide Solutions. BY H. R. CASSEL. *Eng. Min. J.*, October 31, 1903.—The "Purple of Cassius" test, so valuable in chlorination works, is useless for cyanide solutions. If, however, the cyanogen be eliminated by oxidation or other means, the purple color can be formed with just as much delicacy as with chloride solutions. About 50 cc. of ordinary cyanide solution is taken, a small amount of potassium bromate added, and then concentrated sulphuric acid until all effervescence ceases. The bromine in solution is then boiled off, a few drops of hydrochloric acid added and then the stannous chloride. The following is the probable reaction: $2KAu(CN)_2 + 6KBrO_3 + 4H_2SO_4 = 4K_2SO_4 + 2AuBr_3 + 4CO_2 + 2N_2 + 3O_2 + 4H_2O$. A complete test can be made in two to three minutes.

J. W. RICHARDS.

Corrosion of the Nickel Anode in Nickel Plating. BY P. W. BROWN. *Electrochemical Industry*, October, 1903 (read before Am. Electrochemical Soc.).—Electrolytically deposited nickel, and pure rolled nickel, corrode very poorly as compared with cast-nickel anodes. The satisfactory operation of a plating bath depends to a large extent on the character of the anode employed and the efficiency of its corrosion. The presence of copper in the cast nickel is advantageous in facilitating its corrosion, probably by local action or by making the structure more porous. Lack of efficient anode corrosion causes excess of acid in the solution and thus lower efficiency at the cathode. An efficiency of deposition of 90 per cent. can be attained, if cast anodes are used and the anode current density is not over 5 amperes per square foot.

J. W. RICHARDS.

A New Type of Electrolytic Cell. BY P. G. SALOM. *Electrochemical Industry*, October, 1903 (read before Am. Electrochemical Society).—Description of a cell used for the cathodic reduction of lead sulphide (Galena). The cell is a circular table with a sheet lead tray, on which the galena is spread in a thin layer, under dilute sulphuric acid, opposite to lead anodes. The table revolves in one and one-half hours, during which time the ore is subjected to a current of 30 to 60 amperes per square foot. Ore is fed continuously onto the table at a fixed point, and removed at a near-by point after treatment. The table is covered and provided with suction to remove the gases produced. Seventeen of the cells are in operation, producing spongy lead, at the plant of the Electrical Lead Reduction Company, at Niagara Falls.

J. W. RICHARDS.

Electrolysis of Sodium Hydroxide by Alternating Current. BY C. HAMBUECHEN. *Electrochemical Industry*, October, 1903 (read before Am. Electrochemical Soc.).—If aluminum is used as an electrode in fused sodium hydroxide contained in an aluminum vessel, and an alternating current is applied, the aluminum acts as a rectifier, up to 40 volts applied E. M. F., using an iron electrode against it. Passing a current of 9 amperes, and regulating the temperature carefully, considerable metallic sodium collects at the aluminum electrode, experiments showing an efficiency of 73 per cent. on the amperage of the current. The aluminum acts as an electrolytic valve, rectifying the current, and the direct current passing causes the electrolysis. Other metals may possibly be similarly obtainable by alternating current, where direct current is not available.

J. W. RICHARDS.

Aluminum Conductors for Electric Transmission Lines. BY A. D. ADAMS. *Eng. Mag.*, September, 1903.—The three largest electrical transmission lines in the United States are of aluminum; the 144 miles from Colgate to Oakland, California, are of three 0000 wires, weighing each about 1000 pounds per mile. The tensile strength is the same as copper, *viz.*, 33,000 pounds per square inch, and for wires of equal conductivity the aluminum must be made of one-fourth greater diameter than the copper wire, giving it one-half greater area, and one-half greater strength, for only one-half the weight. Aluminum is the cheaper conductor when it costs per pound less than twice the price of copper. The Niagara-Buffalo line cost 12 per cent. less than if of copper. With alternating current at high voltages, the inductance is much less on the aluminum cables. They should be insulated where subject to corrosion by acid fumes or salt air.

J. W. RICHARDS.

Peat Fuel. Its Manufacture and Use. BY W. E. H. CARTER.

Rep. Ontario Bureau of Mines, 1903, pp. 191–234; plates, figures. —A reprint, with slight additions, of Bull. No. 5. of the Bureau of Mines, which was issued in February, 1903.

W. F. HILLEBRAND.

ORGANIC CHEMISTRY

A Comparative Study of *o*-Sulphaminebenzoic Acid and *o*-Carbaminebenzenesulphonic Acid. BY FRANCIS DANIEL WILSON. *Am. Chem. J.*, 30, 353–373.—*Preparation of o-Sulphaminebenzoic Acid*, $H_2NSO_2C_6H_4COOH$. Benzoic sulphinide is heated with sodium hydroxide, the solution filtered when cold, and acidified with hydrochloric acid. The acid crystallizes either anhydrous or with half a molecule of water. It melts at 159° (uncorr.) when heated rapidly, and at 152° when heated slowly. All of its salts crystallize well from water; all contain water of crystallization, except the monosilver, potassium and ammonium salts; all become sweet when they lose their water of crystallization; and all decompose a few degrees above the temperature at which they lose their water of crystallization. *Sodium Salt.*—White amorphous solid, or fine silky needles, containing 2.5 molecules of water. *Potassium Salt.*—White amorphous mass, or large transparent plates. *Calcium Salt.*—Transparent crystals, with $2H_2O$. *Barium Salt.*—Transparent plates or needles, with $3H_2O$. *Strontium Salt.*—Long transparent needle-like crystals, with $2H_2O$. *Zinc Salt.*—Transparent or opaque needle-like crystals, with $3H_2O$. *Magnesium Salt.*—Transparent needles, containing $4H_2O$. *Copper Salt.*—Large blue feathery needles, with $3H_2O$, turning deep green when this water is lost. *Monosilver Salt.*—Light-grey feathery needles. *Disilver Salt*, $AgNHSO_2C_6H_4COOAg$.—Silvery leaflets, with $1H_2O$, which turn dark brown when this water is lost. *Ammonium Salt.*—Transparent plates. *Action of Phosphorus Oxychloride.*—Phosphorus oxychloride converts the free acid into the sulphinide. The *Preparation of the Diamide*, $H_2NSO_2C_6H_4CONH_2$, was accomplished by heating the acid with ammonium thiocyanate. It forms light-colored needles, m. p. 263°. *Preparation of o-Carbaminebenzenesulphonic Acid*, $H_2NCOC_6H_4SO_3H$.—This was carried out by heating the acid potassium salt with ammonium thiocyanate, converting the potassium salt thus obtained into the silver salt, and decomposing the latter with hydrochloric acid. It crystallizes from water in large thick transparent crystals, m. p. 193°–194° (uncorr.). The crystals contain $1H_2O$ and do not become sweet when this is lost; nor does the acid become sweet by continued heating, but decomposes at 125°. Its salts are much more soluble in water than those of the sulphamine acid and do not crystallize as well. Most of them contain water of crystallization, but they do not become sweet when they lose it or when they are decomposed. *Potassium*

Salt.—Large transparent plates or needles, containing 1H_2O; deliquescent. *Silver Salt.*—Large transparent monoclinic plates, with 1H_2O. *Trisilver Salt,* $Ag_2NCOC_6H_4.SO_3Ag$.—White amorphous mass. *Sodium Salt.*—Large transparent monoclinic plates, with 2H_2O. *Barium Salt.*—Transparent plates, with 2H_2O. *Strontium Salt.*—Small transparent crystals. *Calcium Salt.*—Large transparent plates, containing 2H_2O. *Zinc Salt.*—Short thick efflorescent needles, with 3H_2O. *Magnesium Salt.*—Crystalline mass, containing 2H_2O. *Copper Salt.*—Deep blue plates, containing 4H_2O, and turning gray when this water is lost. *Ammonium Salt.*—Large plates, m. p. 262°–263° (uncorr.), and containing 1.5 molecules of water. Heated to 140°, no sweet taste could be detected. *Sulphone Chloride.*—Small thick opaque plates, m. p. 63°. *Potassium o-Cyanbenzenesulphonate,* $KSO_3C_6H_4CN$.—Small transparent needles. M. T. BOGERT.

A Further Investigation of the Action of Phenols and Alcohols on the Chlorides of *p*-Nitro-*o*-Sulphobenzoic Acid. BY VICTOR JOHN CHAMBERS. *Am. Chem. J.*, **30**, 373–392.—*Action of Phenols.*—The *p*-nitro-*o*-sulphone chloride of phenyl benzoate, $NO_2C_6H_3(SO_2Cl)COOC_6H_5$, is formed by the action of phenol on the unsymmetrical chloride, but not from the symmetrical. *o*- and *p*-cresol act in the same way. Both chlorides, when treated with phenol in alkaline solution, give the diesters as the final products. By modifying the conditions of the experiment, ester chlorides are obtained in the case of phenol and *o*-cresol. The *p*-nitro-*o*-sulphonamide of phenyl benzoate is formed by the action of phenol and ammonia upon the symmetrical chloride, but is not obtained from the unsymmetrical. *p-Nitro-o-Sulphone Chloride of Phenyl Benzoate* crystallizes from glacial acetic acid in light-brown heavy needles, melting poorly at 145°–147°. It is completely saponified by boiling dilute hydrochloric acid; boiling water changes it to the free acid and the monophenyl ester, $HSO_3C_6H_4COOC_6H_5$; barium hydroxide solution converts it partially into the barium salt of *p*-nitro-*o*-sulphobenzoic acid and partly into the diphenyl ester; ammonia gives nitrobenzoic sulphinide and the diphenyl ester; aniline gives the anil; alcohols convert it into the monophenyl ester; heating with phenol alone causes no reaction; with phenol and alcoholic potash, the diphenyl ester is formed. *Salts of p-Nitro-o-Sulphophenylbenzoate,* $NO_2C_6H_3(SO_3H)COOC_6H_5$. *BariumSalt.*—Thin lustrous plates, containing 5H_2O; or white knobs, with 6H_2O. *Potassium Salt.*—Heavy needles. Dilute potassium hydroxide completely saponifies the diphenyl ester. *Di-o-cresyl Ester.*—Heavy needles, m. p. 90°. *Sulphone Chloride of o-Cresyl Ester.*—White plates, m. p. 150°. *Di-p-Cresyl Ester.*—Heavy needles, m. p. 118°. *p-Nitro-o-Sulphone Chloride of p-Cresyl Benzoate.*—Small needles or prisms, m. p. 152° (uncorr.). *Di-o-nitrophenyl Ester.*—Fine needles, m. p. 164°. *Di-p-Nitrophenyl Ester.*—Thick needles, m. p. 152°. No ester chlorides could be obtained with the nitrophenols. *Di-β-naphthyl Ester.*—White needles, m. p. 134°. *p*-Aminophenol, resorcinol and hydroquinol also react with the chlorides of *p*-nitro-*o*-sulphobenzoic acid, but the nature of the products was not ascertained. *p-Nitro-o-Sulphonamide of Phenyl Benzoate*, $NO_2C_6H_3(SO_2NH_2)COOC_6H_5$.—Heavy prisms, m. p. 135°. Its behavior with caustic alkalies, ammonia or water, is entirely similar to that of the corresponding unnitrated body. *Action of Alcohols upon the Chlorides.*—The *p*-nitro-*o*-sulphone chloride of ethyl benzoate is formed by the action of ethyl alcohol upon the unsymmetrical chloride, but is not obtained from the symmetrical. Methyl and propyl alcohols act in the same way. By further action of the alcohols, the chlorides are converted into the corresponding acids. *Salts of p-Nitro-o-Sulphomethyl Benzoate*, $NO_2C_6H_3(SO_3H)COOCH_3$. *Sodium Salt.*—Transparent plates. *Potassium Salt.*—Iridescent plates. *p-Nitro-o-Sulphone Chloride of Ethyl Benzoate.*—Heavy white needles, m. p. 68°. *Salts of p-Nitro-o-sulphoethyl Benzoate. Potassium Salt.*—Short heavy prisms, with $1H_2O$. *Barium Salt.*—Long white needles, with $4H_2O$. *p-Nitro-o-sulphone Chloride of Propyl Benzoate.*—Large thin plates, m. p. 76°. *Salts of p-Nitro-o-Sulphopropyl Benzoate. Potassium Salt.*—Small heavy needles. *Barium Salt.*—Large needles of a somewhat greenish hue. and containing $4H_2O$. M. T. Bogert.

The Condensation of Carbon Tetrachloride with Chlorbenzene by Means of the Friedel and Crafts Reaction. By James F. Norris and W. C. Twieg. *Am. Chem. J.*, 30, 392–399.—The product obtained by the interaction of carbon tetrachloride, chlorbenzene and aluminum chloride and previously designated as 4,4'-dichlorbenzophenone chloride, is now found to be a mixture of the 4,4'- with the 2,4'-chloride. There was also separated, from the reaction-product, after removal of the aluminum chloride and hydrolysis of the remaining ketone chlorides, a small amount of an oil, which was probably the 2, 2'-dichlorbenzophenone. In the condensation of carbon tetrachloride and chlorbenzene, therefore, but two chlorine atoms of the tetrachloride are displaced, and three isomeric dichlorbenzophenone chlorides are formed. Experimental.—*2,4'-Dichlorbenzophenone*, $(ClC_6H_4)_2CO$, was prepared from *o*-chlorbenzoyl chloride, chlorbenzene and aluminum chloride. It crystallizes from alcohol in stout colorless prisms, m. p. 66.5°–67°, b. p. 214°–215° at 22 mm. With PCl_5, it is converted into the corresponding *ketone chloride*, a colorless oil, b. p. 223° at 23 mm. *4, 4'-Dichlorbenzophenone Chloride*, from the ketone and PCl_5, melts at 52°–53°. The ketone and two ketone chlorides just described were shown to be identical with three of the substances produced in the condensation of carbon tetrachloride and chlorbenzene. *2,5,2',5'-Tetrachlorbenzophenone Chloride.* By altering the conditions, the yield of this ketone chloride from carbon tetrachloride and *p*-dichlorbenzene has been very greatly increased.

M. T. BOGERT.

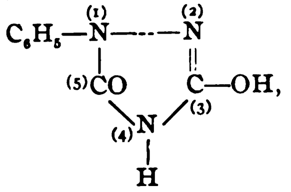
The "Beckmann Rearrangement." III. BY JULIUS STIEGLITZ AND RICHARD B. EARLE. *Am. Chem. J.*, 30, 399–412.—The authors have succeeded in isolating stereomeric chlorimidoethers; the two forms not being mutually convertible, and neither form suffering a "Beckmann rearrangement." These facts are entirely opposed to the explanation of the rearrangement given by Hoogewerff and van Dorp and by Hantzsch, but are in accord with that given by Stieglitz. EXPERIMENTAL.—*m-Nitrobenzchloramide*, $NO_2C_6H_4CONHCl$, from nitrobenzamide and sodium hypochlorite, melts at 183°–184° with decomposition. *Methyl Chlorimido-m-nitrobenzoate* was obtained in two stereomeric forms (α- and β-) by the action of hypochlorous acid upon methylimido-*m*-nitrobenzoate, while the action of diazomethane upon *m*-nitrobenzchloramide gave a much less pure product from which only the α-form was isolated. The α-body crystallizes in silky needles or rectangular plates, m. p. 86.5°–87.5°. The β-body separates in granular masses of very thin rhombohedric plates, m. p. 81°–82°. Both forms show the same molecular weight, give the same hydrochloride of methylimido-*m*-nitrobenzoate when treated with dry hydrochloric acid, and are not identical with *N*-methyl-*m*-nitrobenzchloramide. Physical and structural isomerism being excluded, it follows that they must be *syn*- and *anti*-stereomers. *N-Methyl-m-nitrobenzchloramide*, $NO_2C_6H_4CONCl(CH_3)$, was prepared from *m*-nitrobenzmethylamide and chlorine. It crystallizes in thick monoclinic prisms, m. p. 75°–77°, and is entirely distinct from the two stereomers just described.

M. T. BOGERT.

The "Beckmann Rearrangement." IV. BY JULIUS STIEGLITZ AND RICHARD B. EARLE. *Am. Chem. J.*, 30, 412–421.—*Part I. The Formation of Acylalkylureas in Hoffman's Reaction.* The formation of acylalkylureas in the preparation of alkylamines from halogen amides or from amide, halogen and alkali, is not due to the combination of the isocyanate (liberated in the reaction) with excess of the unsubstituted amide, but with another molecule of the halogen amide, the acylhalogenalkylurea thus formed reacting with the alkali so that an acylalkylurea and a hypobromite (or hypochlorite) are produced. The hypobromite then brominates another molecule of the amide. In the absence of alkali, acylhalogenarylureas may rearrange so that the halogen leaves the N and passes to the aromatic nucleus: $RCO(Hal)CONHC_6H_5 \rightarrow RCONHCONHC_6H_4(Hal)$. EXPERIMENTAL.—*The Action of p-Chlorphenylisocyanate on Benzchloramide* in presence of alkali, results in the formation of *symmetrical benzoyl-p-chlorphenylurea*, $C_6H_5CONHCONHC_6H_4Cl$. The latter was also prepared by the action *p*-chlorphenyl isocyanate on benzamide, and of *p*-chlorphenylurea on benzoyl chloride. It crystallizes in white needles, m. p. 235°–237°. *The Action of Phenyl Isocyanate on Benzchloramide*, in absence of water and alkali, also leads to the production of symmetrical benzoyl-*p*-chlorphenylurea, on account of the migration of the Cl atom in the first product of the condensation. In the presence of alkali, however, the product is the symmetrical benzoylphenylurea (m. p. 205°). *Phenyl Isocyanate and Benzamide* do not combine in presence of alkali, or when heated together at 100°. *Symmetrical Acetylphenylurea*, from acetchloramide, phenyl isocyanate and alkali, melts at 183°–184°. *Symmetrical Acetylmethylurea*, obtained in similar manner, using methyl isocyanate, melts at 178.5°. *Part II. Diacylchloramines*.—It was hoped that dibenzoylchloramine might break down on heating as follows: $(C_6H_5CO)_2NCl \rightarrow C_6H_5COCl + C_6H_5CON$:, the latter being an example of the hypothetical intermediate products assumed by Stieglitz in his explanation of the "Beckmann rearrangement." The experiments, however, showed that the decomposition takes a different course; benzonitrile, chlorine and benzoyl chloride being the main products. Heated with freshly ignited lime, the products were the same. It does not show any tendency to suffer a "Beckmann rearrangement." *Dibenzoylchlorimide*, as prepared by the action of chlorine upon the silver salt of dibenzamide, crystallizes in white needles, m. p. 86°, which are rapidly hydrolyzed by moisture. M. T. BOGERT.

The Production of Anisic Acid by the Oxidation of Aniseed Oil. BY MARSTON TAYLOR BOGERT AND CARL H. ZIEME. *School of Mines Quarterly*, **24**, 500–509.—The authors compared the efficiency of nitric acid, dichromate mixture and potassium permanganate as oxidizing agents of aniseed oil for the preparation of anisic acid. In line with the experience of others, nitric acid was found to be the least satisfactory oxidizing agent. As between the dichromate mixture and an acid solution of potassium permanganate there appears to be but little choice. The dichromate method is more rapid, but does not give so pure a crude product as when acid permanganate is used. M. T. BOGERT.

On the Constitution of Penylurazole (Second Paper). Reactions with Diazomethane. BY S. F. ACREE. *Ber. d. chem. Ges.*, **36**, 3139–3154.—The results of the author's investigations lead him to conclude that the correct formula for phenylurazole is as follows:



and that phenylthiourazole is similarly

constituted. That the body obtained by the action of ethyl iodide upon the silver salt of phenylurazole is really 1-phenyl-3-ethoxy-5-triazolone is corroborated by the fact that with diazomethane, or with methyl iodide and KOH, it yields 1-phenyl-3-ethoxy-4-methyl-5-triazolone. By the action of diazomethane upon phenylurazole in ether solution, 1-phenyl-3-methoxy-5-triazolone and 1-phenyl-3-methoxy-4 methyl-5-triazolone are formed, and with phenylthiourazole corresponding thio derivatives are obtained. In both cases, the methyl group at 3 is introduced more easily than at 4. EXPERIMENTAL.—*Phenylurazole* is obtained from ethyl phenylsemicarbazide-α-carboxylate, $C_6H_5N(COOC_2H_5)NHCONH_2$, which exists in two mutually interconvertible modifications (m. p. 154° and 172°). By saponifying this ester with alkali and then acidifying the solution, phenylurazole is formed. Phenylurazole is a monobasic acid, which can be titrated direct with alkali, using phenolphthaleïn or Poirrier's Blue as indicator. *Di-silver Salt*, $C_6H_5C_2N_3(OAg)_2$; light grey. *1-Phenyl-3-ethoxy-5-triazolone* is identical with the similar compound described by Wheeler. *1-Phenyl-3,5-diethoxytriazole*, from the action of ethyl iodide upon the disilver salt of phenylurazole or upon the silver salt of the mono-ethoxy derivative, crystallizes in fine needles, m. p. 53°, which are highly magnetic. By the action of alcoholic hydrochloric acid, phenylurazole is regenerated. *1-Phenyl-3-ethoxy-4-methyl-5-triazoline*, from the sodium salt of the 3-ethoxy body and methyl iodide, or from the free 3-ethoxy body and diazomethane, melts at 95°. Evaporated with alcoholic hydrochloric acid, *1-phenyl-4-methylurazole* (m. p. 223°–224°) is produced. By the action of excess of diazomethane upon phenylurazole, or upon its 3-methoxy derivative, or by the action of methyl iodide at 100° upon the sodium salt of the latter, *1-phenyl-3-methoxy-4-methyl-5-triazolone* is obtained. It crystallizes in needles, m. p. 95°, and with alcoholic hydrochloric acid gives 1-phenyl-4-methylurazole. By the action of diazomethane upon an excess of phenylurazole, *1-phenyl-3-methoxy-5-triazolone* is produced. It forms leaflets, m. p. 197°, and is saponified to phenylurazole by hot alcoholic hydrochloric acid. *1-Phenyl-2-acetyl-4-methylurazole*, from 1-phenyl-2-acetylurazole and diazomethane, crystallizes from alcohol in fine needles, m. p. 94°–95°; by fusing and heating for some time at 140°, the melting-point is raised to 113°–115°. Warmed with sodium hydroxide or with hydrochloric acid, 1-phenyl-4-methylurazole is formed. *1-Phenyl-3-thiourazole* is prepared from ethyl phenylthiosemicarbazide-α-carboxylate, in the same manner as already given for the oxygen compound. It is a yellow powder, m. p. 195°. By the action of alkyl iodides upon the free urazole or upon its salts, the corresponding thioethers were prepared, and found to be monobasic acids. Iodine solution oxidizes the thiourazole to the corresponding *disulphide*, m. p. 253°. The

Di-silver Salt of the thiourazole forms a light gray powder which, like the corresponding oxygen compound, soon turns dark brown. *1-Phenyl-3-methylthio-5-triazolone* can be prepared by the action of diazomethane or of methyl alcoholic hydrochloric acid upon phenylthiourazole, or of methyl iodide upon the silver or potassium salt of the latter. It melts at 178°, and gives off methyl mercaptan when treated with concentrated hydrochloric acid. *1-Phenyl-3-ethylthio-5-triazolone*, from the silver salt of phenylthiourazole and ethyl iodide, melts at 138°. *1-Phenyl-3-methylthio-4-methyl-5-triazolone*, from 1-phenyl-3-methylthio-5-triazolone and diazomethane, from the sodium salt of the former with methyl iodide, or from the sodium salt of 1-phenyl-3-mercapto-4-methyl-5-triazolone with methyl iodide, melts at 95°, and is not attacked by warm alcoholic hydrochloric acid.

M. T. Bogert.

New Derivatives of the Isocyanates: Hydrochlorates of Carbonylhydrazines. By S. F. Acree. *Ber. d. chem. Ges.*, **36**, 3154–3158. — *Carbonyldiphenylhydrazine Chlorhydrate* (*α,α-Diphenylhydrazine-β-carbonic Acid Chloride*, $(C_6H_5)_2NNHCOCl$, is readily obtained by the interaction of phosgene and unsymmetrical diphenylhydrazine in dry benzene solution. It is a white solid, which is readily attacked by hydrazines, amines, alcohols, alkalies or hot water. Boiled for half an hour with water or treated with more diphenylhydrazine in benzene solution, tetraphenylcarbazide is produced; while the action of aniline causes the formation of triphenylsemicarbazide. At 140°–150° it decomposes with liberation of hydrochloric acid and formation of the free *carbonyldiphenylhydrazine*, $(C_6H_5)_2N.N{:}CO$. *Tetraphenylcarbazide*, $(C_6H_5)_2NNHCONHN(C_6H_5)_2$, can also be obtained from phosgene and diphenylhydrazine, or from free carbonyldiphenylhydrazine and diphenylhydrazine. It melts at 239°–240°, shows weak acid properties, and turns blue in the air. *Triphenylsemicarbazide*, $(C_6H_5)_2NNHCONHC_6H_5$, melts at 206°–207°, and is probably identical with the compound (m. p. 193°) obtained by Richter from diphenylhydrazine and phenyl isocyanate.

M. T. Bogert.

BIOLOGICAL CHEMISTRY.

The Hydrolysis and Synthesis of Fats by Platinum Black. By Hugh Neilson. *Am. J. Physiol.*, **10**, 191–201.—On comparing the catalytic action of platinum black with that of lipase on ethyl butyrate, the following facts were observed: platinum black accelerates the hydrolysis of ethyl butyrate, as lipase also does. But the action of the platinum is slower. The action of the platinum increases with the increased concentration of the platinum. This is also true of lipase. The action increases with the temperature, reaching its maximum at 50° C., which is somewhat higher than the lipase. The action of platinum is independent of the concentration of the ethyl butyrate, which seems also to be true of the action of lipase. Poisons, with the exception of sodium fluoride and hydrocyanic acid, affect the catalytic action of platinum in a manner quite comparable to their action on lipase. Platinum black synthesizes butyric acid and ethyl alcohol into ethyl butyrate, as shown by the increasing odor of ethyl butyrate and saponification giving odor of butyric acid. This synthesis is also brought about by lipase. F. P. UNDERHILL.

The Relative Toxicity of Distilled Water, Sugar Solutions, and Solutions of Single Constituents of Sea-Water for Aquatic Animals. BY JACQUES LOEB. Pflüger's *Archiv.*, 97, 394–409 (Abst. *J.*, *Chem. Soc.* (Lond.)).—Aquatic animals, in their behavior with relation to distilled water, may be divided into three groups. The first, for example, *Fundulus*, contains those to which it is harmless. The eggs of this animal neither swell in distilled water, nor shrink when placed in salt solution. They are surrounded with an impermeable membrane. Osmotic conditions evidently are not the only ones that play a part in the life processes of such animals. To the second group belong such animals or their tissues which are surrounded by a semi-permeable membrane, which is easily permeable to water, and impermeable or only slightly permeable to many salts. The red blood corpuscles and sea-urchin eggs fall into this group. The effect of reagents is here purely mechanical, and is explained by diffusion of certain ions. The effect of various salts on contractile tissues comes mainly under this head. *Gammarus*, a marine crustacean with which the majority of experiments recorded in this paper deals, is an instance of the third group. Distilled water is rapidly fatal, so also is a solution of sugar or common salt of osmotic pressure equal to that of the sea-water in which it lives. Isotonic solutions of other constituents of the sea-water are even more toxic. No doubt in ordinary sea-water the salts act antagonistically, and death is attributable to the discharge of ions from the living tissues. F. P. UNDERHILL.

The Status of Phosphorus in Certain Food Materials and Animal By-products, with Special Reference to the Presence of Inorganic Forms. BY E. B. HART AND W. H. ANDREWS. *Am. J. Chem.*, 30, 470–485.—Commercial feeding-stuffs of vegetable origin do not contain appreciable quantities of phosphorus in inorganic form. The animal feeding material, such as liver meal and dried blood, are also approximately free from this form of phosphorus. Commercial meat meal, liable to carry varying quantities of bone, does contain inorganic phosphorus, dependent upon the amount of bone present. The feces of the cow employed in this investigation were also free from inorganic phosphorus. Germinated grains are rich in forms of soluble organic phosphorus. Germination, extending over a period of two weeks, on oats, corn, and wheat, did not transform organic phosphorus into organic forms. F. P. UNDERHILL.

On the Fertilization of Sea Urchins with Starfish Sperm. BY JACQUES LOEB. *Pflüger's Arch.*, 99, 323–357.—The ova of *Strongylocentrotus purpurtus* can be easily fertilized with sperm of the same kind in sea-water or in a van't Hoff solution. For the purpose, to every 100 cc. of the latter solution is added 0.1 to 0.2 cc. tenth-normal sodium hydroxide solution or 0.4 to 0.2 cc. $^5/_8$ *m* sodium bicarbonate. In the one sub-solution employed, the ova of the sea urchin could either not at all or only in very small numbers be fertilized by the sperm of the starfish (*Asterias ochracea*). On the other hand, the sea urchins were fertilized rapidly and in large numbers by the starfish sperm in a van't Hoff solution to which had been added for 100 cc. 0.3 to 0.4 cc. of tenth-normal sodium hydroxide solution. In the sub-three solutions employed, the ova of the sea urchin could not be fertilized, or at most, only in small numbers by the sperm of the same kind. F. P. UNDERHILL.

On the Action of Saline Purgatives in Rabbits and the Counteraction of Their Effect by Calcium. BY JOHN BRUCE MACCALLUM. *Am. J. Physiol.*, 10, 101–111.—In general, the saline purgatives act not only when introduced into the intestine, but also when injected subcutaneously or intravenously. The intensity of their action is greatest with barium chloride and decreases approximately in the following order: Barium chloride, sodium citrate, fluoride, sulphate, tartrate, oxalate, and phosphate. The purgative action of these salts is caused, first, by an increase in peristalsis and, second, by increased secretion of fluid into the intestine, both of which can be directly observed. Intravenous injection of 1–2 cc. *m*/8 solution of these salts causes increased peristalsis within one minute. When introduced into the intestine, it takes ten to fifteen minutes, and five times the amount to produce an equal effect. This indicates that even when salts are introduced into the intestine, they must be absorbed into the blood before they can produce their purgative effect, and that they affect the intestine by increasing the irritability of the nerves and muscles, as Loeb has suggested. Their action in producing less solid feces is not due to the prevention of the absorption of fluids from the intestine, but to the production of an increased secretion of fluid into the intestine. By the continued administration of small doses of sodium citrate, a chronic condition of hypersensitiveness of the nervous system may be brought about in rabbits, which persists for a considerable time after the drug is discontinued. By the injection of calcium chloride solutions, the peristalsis caused by these salts can be entirely inhibited. There is a perfect analogy between their action and the production and suppression of muscular twitchings and nervous hypersensitiveness. The administration of calcium is, therefore, rational, especially in those cases of diarrhoea in human beings which accompany hysteria or nervous excitability of any sort. F. P. UNDERHILL.

The Cerebro-Spinal Fluid in Hydrocephalus. BY ISADOR H. CORIAT. *Am. J. Physiol.*, **10**, 111–115.—The fluid which was obtained from a congenital hydrocephalic imbecile consisted of about 1000 cc. of a clear straw-colored fluid that did not coagulate spontaneously. The reaction was faintly acid, the specific gravity 1.012, and the coloring-matter was identified as lutein. Pyrocatechin, cholesterin and cholin were absent, while the presence of fat, urea, proteid in the form of serum globulin only, and a reducing substance, probably dextrose, could be shown. The inorganic constituents consisted of phosphorus, potassium and sodium; calcium and magnesium were present in traces, while iron was absent. The presence of a diastatic ferment could also be proved. F. P. UNDERHILL.

On the Time Relations of Proteid Metabolism. BY P. B. HAWK. *Am. J. Physiol.*, **10**, 115–146.—The aim of the present investigation has been to determine : the length of time elapsing between the ingestion of large amounts of proteid food and the excretion of increased amounts of nitrogen, sulphur, and phosphorus in the urine. The balance of income and outgo of nitrogen, sulphur, and phosphorus ; and the relation between the nitrogen content of the urine and the heat of combustion of its water-free substance. A preliminary period was passed on a diet containing 14.86 grams of nitrogen per day. On the fifth day a portion of the normal diet containing 2.46 grams of nitrogen was replaced by a proteid food containing 12.60 grams of nitrogen. After this the preliminary diet was again taken up. The urine was collected every three hours during the day and in nine hour periods during the night. The urine and faeces were analyzed for total nitrogen, sulphur, and phosphorus. The results show that for the two experimental subjects the normal curve for the nitrogen excretion has two points of maximum excretion. On the day of the extra proteid ingestion a single maximum was observed, and the return to the normal condition of two maxima occurred on the second day with one subject, and on the third day following with the other subject. After the ingestion of the extra proteid, the nitrogen excretion began an immediate, rapid rise to the point of maximum excretion. This maximal point was followed by a very rapid fall in nitrogen excretion which passed, in a few hours, into a more gradual return to the normal rate of excretion. The minimum nitrogen excretion occurred during the night period. In general, the sulphur excretion followed that of the nitrogen. The course of the phosphorus excretion in one subject showed a tendency toward the formation of two maxima daily; with the other subject only one maximal point was observed. The ratio of the nitrogen content of the urine to the heat of combustion of its unoxidized material was somewhat lower on the day of the extra proteid ingestion than on normal days. F. P. UNDERHILL.

On the Distribution of Osseomucoid. BY CHRISTIAN SEIFERT AND WILLIAM J. GIES. *Am. J. Physiol.*, **10**, 146–149.—Osseomucoid has been detected in and separated from the bones of the following animals: man, rabbit, seal, cat, dog, black bear, ox, sheep, deer, caribou, pig, tapir, kangaroo, woodpecker, sea-gull, partridge, chicken, turkey, marsh hawk, blue heron, surf snipe, flamingo, ostrich, alligator, turtle and cod. All bones thus far tested have yielded positive results. F. P. UNDERHILL.

Quantitative Estimation of Phosphates in Stomach Contents. BY GEORGE H. A. CLOWE. *Am. J. Pharm.* **75**, 325–330. Abst. *J. Chem. Soc.* (Lond). November, 1903.—When phosphoric acid is titrated with normal sodium hydroxide solution, using alizarin as indicator, neutrality is indicated by the formation of sodium dihydrogen phosphate; with phenolphthalein as indicator, disodium hydrogen phosphate is produced, while in the presence of excess of barium chloride and of sodium hydroxide, the excess of the latter being titrated in presence of phenolphthalein, neutrality is indicated with the formation of trisodium phosphate. Other indicators, including dimethylaminoazobenzene, give less definite end-points, so that the usual practice of regarding the difference between two titrations, in presence of alizarin and dimethylaminoazobenzene respectively, as due to acid phosphates and organic acids, and that between two titrations using respectively alizarin and phenolphthalein, as due to hydrochloric acid, is inaccurate. The following process is proposed: at least 20 cc. of the contents are evaporated to dryness and the residue gently incinerated, the ash is dissolved in dilute sulphuric acid and the solution made up to 25 cc. Of this liquid, 10 cc. are exactly neutralized with sodium hydroxide solution, using phenolphthalein as indicator; alizarin is then added and the liquid made neutral to this indicator by titration with decinormal sulphuric acid. This reading is the equivalent of one of the acid functions of the phosphoric acid present. To another 10 cc. of the liquid, neutralized as before, a slight excess of barium chloride is added, followed by a definite excess of sodium hydroxide. The mixture is boiled for one minute, slightly cooled, and titrated with normal sulphuric acid in presence of phenolphthalein. The difference between the amounts of acid and alkali added is the equivalent of another acid function of the phosphoric acid present and should be identical with the previous reading. F. P. UNDERHILL.

On the Occurrence of Invertase in Plants. BY J. H. KASTLE AND MARY E. CLARK. *Am. Chem. J.*, **30**, 422–428.— Invertase is very widely distributed in the vegetable kingdom. Up to the present, nineteen different species of plants, representing fourteen different families, have been examined for the enzyme, and in each case its presence has been demonstrated. The inferences drawn from these facts leads one to suppose that invertase is of very great importance in the plant metabolism.

F. P. UNDERHILL.

Precipitins and Their Medico-Legal Use. BY JAMES EWING AND ISRAEL STRAUSS. *Med. News*, **83**, 878–880 and 925–934.— A resumé of the work done on precipitins to date with criticisms of methods employed together with modifications and precautions of technique to be used. F. P. UNDERHILL.

A Study of Immunity. Ehrlich's Side-Chain Theory. BY F. M. POTTINGER. *Med. News*, **83**, 880–883.—A review of the field of immunity with the application of Ehrlich's theory.

F. P. UNDERHILL.

Emulsion-Albuminuria. BY ISADOR CARIOT. *Med. Record*, **64**, 773–776.—In certain diseases there is passed urine having a milky appearance that is not, however, due to the presence of fat. It is the so-called emulsion-albumin urine, and the peculiar color and appearance are due to the presence of proteid in a colloidal state. F. P. UNDERHILL.

The Nucleic Acid of the Wheat Embryo. BY ISAAC F. HARRIS. *J. Elisha Mitchell Soc.*, 19th year, Pt. II.—Being a resumé of the investigations of Osborne and Harris on the nucleic acid of the wheat embryo. See this Review for abstract.

F. P. UNDERHILL.

PHARMACEUTICAL CHEMISTRY.

The Benzine of the Pharmacopoeia. BY E. H. GANE. *Pharm. Era*, 30, 307.—Attention is called to the fact that it is very difficult to purchase a petroleum ether answering to the requirements of the pharmacopoeia or having a fairly constant boiling-point. The results of several carefully conducted fractional distillations are given. From these as well as from admissions of manufacturers, the writer concludes that the lighter hydrocarbons "crack," or are changed by dissociation or polymerization, into compounds of different boiling-point. W. H. BLOME.

On the Qualitative Testing of Methyl Alcohol when Mixed with Ethyl Alcohol. BY LEONARD D. HAIGH. *Pharm. Rev.*,

21, 404.—The method given is a modification of the one proposed some time previously by Prof. A. B. Prescott. Mr. Haigh dilutes 1 cc. of the suspected alcohol to about 10 cc. with water. A coil of copper wire is heated to redness and plunged into the diluted alcohol, held there for a moment, and then immersed in water; this operation being repeated several times to oxidize the greater portion of the alcohol. After filtering, the liquid is boiled until the odor of acetaldehyde becomes very faint. It is then poured into a porcelain dish and five drops of a phloroglucinol solution in fixed alkali is added. The presence of methyl alcohol in the original solution is indicated by the immediate appearance of a bright red color, which remains from two to three minutes, while if ethyl alcohol alone were originally present, a faint, rapidly-fading, reddish color may appear.

After driving off the acetaldehyde by boiling, the Rimini test may be applied for the detection of formaldehyde, in place of the one given above. Add to the solution, prepared as above outlined, a dilute solution of phenylhydrazine hydrochloride, then a few drops of a freshly prepared solution of sodium nitroprusside, and lastly 1 cc. of 50 per cent. solution of sodium hydroxide. Formaldehyde gives a light blue or green color, depending upon the amount of methyl alcohol originally present. These tests reveal the presence of as small a proportion as 5 per cent. of methyl alcohol in ethyl alcohol. W. H. BLOME.

Mint, Its Early History and Modern Commercial Development. BY A. M. TODD. *Pharm. Era*, **30**, 316 and 341.—As the title indicates, Mr. Todd goes very minutely into the history of peppermint, tracing it and its development since the very earliest times. In this country the oil was first obtained by distillation from copper stills containing water, in which the plants were immersed, a fire being maintained directly under this container. The escaping steam, laden with oil, was condensed in a crude manner. Improvements have been made, not so much in the process as in the still. Nowadays large wooden steam-tight vats with hinged covers, are used. The vat is provided at a short distance from the bottom with a perforated removable bottom, upon which as much as four thousand pounds of the dried peppermint is placed at each charge. Steam from a separate generator is passed into the vat below the perforated bottom, which, in passing through the mass of herb becomes laden with the oil and is condensed in improved tubular condensers.

The yield of oil is very variable; under very favorable conditions 9 to 10 pounds have been obtained from 1000 pounds of plants, but under unfavorable conditions, less than 1 pound has been obtained from the same quantity of plants. On account of the short crop of 1902 the oil has recently been adulterated to an alarming degree. W. H. BLOME.

AGRICULTURAL CHEMISTRY.

Association of Official Agricultural Chemists.—The twentieth annual convention of the Association of Official Agricultural Chemists was held at the Columbian University, Washington, D. C., November 19-21, 1903. The convention was presided over by the president, R. J. Davidson, who called attention in his opening address to the origin and growth of the association, the desirability of uniform fertilizer laws, and the need of more active coöperation by members of the association in the testing of methods; and recommended that a change be made in the temperature used for the graduation of measuring apparatus, and that the association consider the advisability of republishing Battle and Dancy's chemical conversion tables. Dr. Charles W. Needham, president of the Columbian University, welcomed the association on behalf of the university. Hon. James Wilson, Secretary of Agriculture, was also present upon invitation, and addressed the association, mainly upon the progress being made in the execution of the law regarding the importation of food products. All of the referees and many of the associate referees submitted reports, and in addition several papers were read. The attendance exceeded that in previous years. The more important points in the reports, papers and discussions are summarized under the following headings:

Phosphoric Acid, B. H. Hite, referee.—The work undertaken by the referee during the year was not completed, and a report upon the progress made was considered inadvisable at present. The associate referee, C. B. Williams, reported comparative tests of volumetric and gravimetric methods for determining total phosphoric acid in soils. The volumetric method was believed to be the preferable method, and was recommended for adoption as an optional method. The increasing commercial importance of basic phosphatic slags led the association to take up again the consideration of this question. The referee for next year was accordingly instructed to study methods for the basic phosphatic slags, and also for Redonda and precipitated phosphates.

A paper on "The Determination of Organic and Inorganic Phosphorus in Vegetable and Animal Materials," by E. B. Hart and W. H. Andrews, was presented in this connection. This work was previously published as Bulletin 238 of the New York State Station, and has been noted in this Journal (**26**, R. 25.)

Determination of Nitrogen, F. W. Morse, referee.—Coöperative tests of the alkaline and neutral permanganate methods for determining available organic nitrogen were reported. Further study of this subject was suggested, and the recommendation was made and approved by the association, that in case of mixed fertilizers 2 grams of material be used and in case of concentrated goods, an amount containing approximately 0.075 gram of nitrogen, as heretofore.

A paper on "The Electrolytic Reduction of Nitrogen in Metallic Nitrates," by S. H. Sheib, gave results of tests which were considered by the author to be far from satisfactory as to the value of this method.

Separation of Nitrogenous Bodies, L. L. VAN SLYKE, referee. —Methods devised by the referee and E. B. Hart for the separation and estimation of caseïn monolactate and caseïn dilactate in milk were presented by the referee, and were adopted as provisional methods by the association. From the results of his investigations during the year, the referee concluded that the Hess and Doolittle test for process butter must be regarded as worthless. The report of the associate referee on vegetable proteids was not ready for presentation but is to be included in the official proceedings.

The associate referee on meat proteids, W. D. Bigelow, reported tests of various reagents for meat proteids. Solutions were made of several commercial products and subjected to the action of bromine, zinc sulphate, phosphotungstic acid, and tannin and salt. The filtrates from the precipitates obtained by the last three reagents were further treated with different combinations of the reagents mentioned. The use of bromine alone was shown, as in earlier work, to be unreliable. In the preliminary tests, the order in which various reagents were employed apparently exerted a marked influence. A further study of the combinations of reagents was deemed advisable.

In a paper by H. S. Grindley, entitled "A Study of the Nitrogenous Constituents of Meats," comparisons were made of the amounts of proteids in water extracts of raw and cooked meats precipitated by various reagents. Precipitation by bromine was found unsatisfactory. The results obtained by the different methods on different samples varied greatly. The author announced that his studies of the coagulable proteids in water extracts of meats were to be continued.

J. S. Chamberlain read a paper on "The Determination of Gliadin and Glutenin in Flour by the Fleurent-Manget Method." This method was believed to give too high results for gliadin, and consequently, too low results for glutenin. A method for the estimation of the proteids of flour was submitted.

Potash, F. B. CARPENTER, referee.—The referee reported coöperative results by 18 analysts on the determination of potash in mixed fertilizers and moisture in potash salts. In the determination of potash, a modification of the official method consisting in the addition of a small amount of hydrochloric acid to liberate any occluded potash, and the use of sodium hydroxide instead of ammonium hydroxide was suggested. The moisture determinations by the official method did not show satisfactory agreement.

Soils, F. P. VEITCH, referee.—The referee reported upon work relating to the determination of available potash and phosphoric acid in soils, the analysis of alkali soils, and soil acidity. Digestion with N/200 hydrochloric acid was found to remove, usually, less phosphoric acid and more potash than were removed by the crops grown. It was therefore recommended that tests be made of stronger acid solutions in the determination of available phosphoric acid. The results of determinations of potash in aqueous solutions, while not bearing out the indications of preliminary work, were believed to justify further tests, the ratio of solvent to soil being changed to 10 to 1. The results of tests of methods for alkali soils, by A. Seidell and B. E. Brown, were presented by the referee, who submitted methods for the analysis of such soils. In his investigations on soil acidity, the referee tested the sodium chloride and lime-water methods proposed at the last meeting of the association. The referee believed that a slightly alkaline soil furnishes the best condition for the economical production of crops, and that the lime-water method shows, beyond a doubt, the amount of lime required to render the soil alkaline. The sodium chloride method almost invariably gave lower results.

J. G. Lipman reported studies on the fixation of atmospheric nitrogen by bacteria. The behavior of *Azobacter vinelandii*, a nitrogen-fixing micro-organism isolated by Dr. Lipman, was illustrated by the results of several series of laboratory experiments.

H. J. Wheeler reported that the results of experiments extending over several years showed that Redonda phosphate has very little value upon acid soils. The results, on the contrary, were much better on limed soils. Certain crops, such as millet, however, were noted as utilizing some of this phosphate upon unlimed soils. As this phosphate is used extensively in the manufacture of mixed fertilizers, it was believed that the soils must be put in such condition as to render the phosphate effective; or else methods of analysis must be devised for discriminating against this material.

Dairy Products, G. W. CAVANAUGH, referee.—The referee recommended further study of the effect of preservatives upon the albumin of milk, with special reference to the quantitative determination of albumin. G. E. Patrick called attention to several samples of oleomargarine which responded to the Waterhouse test for genuine butter.

Foods and Feeding-Stuffs, F. D. FULLER, referee.—The referee reported tests by a number of analysts of methods of determining ether extract and crude fiber. In the determination of ether extract, the Dormeyer method gave higher results than the official method. In the determination of crude fiber the official method gave higher results than the König method, or the König method modified by the additional treatment of the fiber with sodium hydroxide. The referee believed that this difference was due in part at least to a hydrolytic action of the glycerol-sulphuric acid mixture used in the König method. The König method recovered only 87.6 per cent. of crude fiber from absorbent cotton treated successively with dilute acid and alkali.

A paper by C. A. Browne, Jr., entitled "Notes upon the Analysis of Feeding Materials," was presented. It was reported that in feces from steers fed rice bran and rice polish, an excess of fat, amounting in one instance to over 1 per cent., was obtained by submitting the residue from ordinary fat extraction to pepsin digestion and again extracting. The total acidity of feeding-stuffs was determined satisfactorily by extraction with 90 per cent. alcohol and titration with decinormal alkali.

Food Adulteration, W. D. BIGELOW, referee.—Attention was called to the extent of the work done during the year, and the following reports of the associate referees were presented:

W. G. Berry submitted a synopsis of a report on colors which is in preparation, and requested collaboration on several points, such as the solubility of coloring-matters in various solvents and the characteristics of natural coloring-matters in fresh fruits, vegetables and wines.

L. S. Munson reported that very little work had been done on the subject of fruit products during the year.

C. A. Crampton reported coöperative work on the determination of free and combined acids, aldehydes, furfural, and coloring-matters in distilled liquors, and recommended several changes in the provisional methods of the association along this line.

A. L. Winton called attention to the desirability of better methods for the examination of lemon extracts and the determination of artificial fruit ethers and referred to the facts brought out by the Dairy and Food Department of Michigan concerning the manufacture of a lemon extract by the treatment of lemon oil with dilute alcohol, which removes the citral without any appreciable quantity of the terpenes, and thus permits the manufacture of a second extract from the washed-out oil.

R. E. Doolittle made several suggestions concerning the analysis of spices, based upon the results of his examination of a number of samples of pure pepper.

L. M. Tolman, the associate referee on oils and fats, reported extended investigations of the Hübl, Hanus and Wijs methods by himself and a number of analysts; studies of other problems in the determination of iodine absorption; and coöperative work upon the Dalican titer test. From the results of the work as a whole, the Hanus method was believed to be better than either of the other methods. The results obtained by the Dalican method were presented merely as preliminary.

A. E. Leach, as associate referee on dairy products, outlined methods for the detection of preservatives and coloring-matter in dairy products, the determination of fat in cheese, and the analysis of condensed milk, which methods were adopted as provisional methods by the association.

W. D. Bigelow in reporting on preservatives called attention to the work in progress, stating that no definite results had been obtained.

A. E. Leach read a paper upon "The Determination of Commercial Glucose in Some Saccharine Products," suggesting that in the determination of commercial glucose in such products as honey, jams, and jellies the sample should be neutralized immediately after inversion. This paper called forth considerable discussion as to the determination of glucose. The proposition to express results in terms of glucose polarizing at a definite figure seemed to meet with general approval. The factor 175 was considered by L. S. Munson as too high.

Sugar, L. M. TOLMAN, referee.—Very little work was done on this subject during the year. L. S. Munson, associate referee, stated that he had prepared a solution which had about one-third the action on cane-sugar as the regular Soxhlet solution.

H. E. Sawyer in remarks on the analysis of molasses, stated that in clarifying low-grade goods he had found the use of a solution of basic lead acetate of 26 grams in 500 cc. more satisfactory than the stronger solution required by the official method.

The association adopted as official methods the determination of the copper reduced by the direct weighing of the cupric oxide and the German official method for the determination of sucrose and raffinose in essentially the same form as recommended last year.

Tannin, G. A. KERR, referee.—The referee reported coöperative tests on the determination of soluble solids and acidity in extracts. The results favored the use of a single filter-paper, confirming the results reported last year. Favorable results were obtained by diluting 1.6 grams of a fluid chestnut extract, and 0.6 gram of a solid quebracho extract to 100 cc. and determining results otherwise by the official method. In determining acidity, the charcoal method tested last year gave much lower results than the provisional method.

Insecticides and Fungicides, J. K. HAYWOOD, referee.—The referee reported coöperative tests of methods for the examination of Paris green, London purple, copper carbonate, potassium cyanide, soda-lye, tobacco extract, and formalin. The method for the determination of total arsenious oxide in Paris green, given as Method I, in Circular 10, of the Bureau of Chemistry, was adopted as an official method. Several suggestions made by the referee concerning the further tests of methods were approved. The subject of disinfectants was assigned to the next referee on insecticides and fungicides.

Ash, G. S. FRAPS, referee.—Coöperative tests of the nitric acid and sodium peroxide methods for the determination of total sulphur were reported. The nitric acid method gave lower results than the peroxide method. A further study of the peroxide method was recommended. In the determination of sulphates, the method described last year, providing for the extraction of the substance with 1 per cent. hydrochloric acid, was adopted provisionally.

Miscellaneous.—W. Frear, as chairman of the Committee on Food Standards, reported upon the work of this committee during the year in formulating definitions and standards for submittal to the Secretary of Agriculture.

H. W. Wiley, chairman of the Committee on Fertilizer Legislation, reported that the members of the committee were individually in favor of National legislation upon this subject. Upon motion of the chairman, this committee was instructed to present next year a definite report upon the form which this legislation should assume.

A committee of the American Chemical Society, having under investigation the subject of purity of chemicals, presented to the association, by request, an outline of the work being done by the committee.

The Bureau of Standards was invited to coöperate with the association in establishing the accuracy of methods of analysis.

Provision was made for the appointment of an additional referee next year, the subject assigned being "Medicinal Plants and the Drugs Made from Them."

The following officers were elected for the ensuing year: *President*, M. E. Jaffa, Berkeley, Cal.; *Vice-President*, C. L. Penny, Newark, Del.; *Secretary*, H. W. Wiley, Washington, D. C.; *Additional Members of Executive Committee*, W. P. Headden, Fort Collins, Colo.; W. R. Perkins, Agricultural College, Miss.

H. W. LAWSON.

PATENTS.

JULY 7, 1903.

732,707. Thomas J. Carlton, Iola, Kansas. **Refractory lining.** Water 15 gallons, cobalt 25 ounces, black lead 25 pounds, burnt fire-clay 10 pounds, saltpeter 1 pound.

732,708. Henry R. Cassel, New York, N. Y. **Extracting gold.** An alkaline bromide is mixed with sulphuric acid and the ore treated with the free bromine, then a bromate and acid are used to decompose the bromide and the bromine distilled off, the gold precipitated by H_2S and the bromine vapors led into an alkaline hydroxide to form hypobromite and bromide for further use.

732,709. **As above** for apparatus to carry out the above process, comprising a treating tank surrounded by numerous solution tanks, towers, connecting pipes and pumps for the successive application of the solutions described.

732,732. William D. Gilman, Baltimore, Md. **Lithophone and Glauber salt.** Niter cake is steamed with excess of zinc till the acid is neutralized, then the iron, alumina, etc., are precipitated by calcium chloride, a solution of barium sulphide added to precipitate lithophone ($BaSO_4 + ZnS$) and the remaining solution concentrated to crystallize out the Glauber salt.

732,753. Pierre Lederlin, Chedde, France. Electrolytic manufacture of **chlorates** and **perchlorates.** No diaphragm or chromic salt is used as in the ordinary process, the electrolyte of a suitable chloride as sodium chloride is maintained acid by hydrochloric acid.

732,843. William Gardner, Chicago, Ill. Assignor to Northwestern Storage Battery Company, same place. Preparing **electrolytes.** A metal is deposited on an electrode in excess by repeatedly charging a cell containing a solution of a metallic oxide and caustic alkali, and replenishing the oxide between successive charges, and when sufficient metal is deposited, replenishing the caustic alkali.

732,894-5-6. Samuel S. and Benjamin Ruston, Syracuse, N. Y. **Water paint.** Milk and an emulsion of oil and lime slaked with a solution of aluminum sulphate, giving calcium sulphate in the product, are heated, treated with acid, and the fatty curd added. The second patent substitutes rosin for oil. The third uses zinc sulphate in place of aluminum sulphate.

732,929. Andrew A. Dunham, New York, N. Y. Assignor to Casein Company, New Jersey. **Food substitutes** for eggs. Moist casein 100, dried milk 17, sodium bicarbonate 2.5, egg albumen 2, and sodium chloride 1, all pounds, all mixed and well dried in warm air.

732,937. Charles B. Graham, South Haven, Mich. **Refining oil.** The oil is passed through a compound of lime-water 80, caustic potash and pyrogallic acid 10 parts each.

732,979. Mary F. Ward, Providence, R. I. **Artificial fuel.** Coal ashes 50, sawdust 12, sand 6, paraffin 31, and sodium nitrate 1 part, heated, mixed, molded and cooled.

733,000. Ferdinand Brunjes, Langenheim, Germany. Making **zinc sulphide** from copper slag. Dilute hydrochloric acid converts the sulphides of the slag into chlorides, liberating hydrogen sulphide and thereby precipitating zinc sulphide, separating the precipitate and adding to the solution an alkaline earth sulphide to convert any zinc chloride into sulphide.

733,017. Robert K. Duncan, Pottstown, Pa. Assignor to General Chemical Co., New York, N. Y. Apparatus for making **phosphorus.** An electric furnace, a decomposing chamber, a storage tank for phosphine, a drying chamber connected with the storage tank, a heating chamber for decomposing the phosphine and receiver for the products of decomposition.

733,028. Emanuel Goldberg, Moscow, Russia. **Coating iron with zinc.** The electrolyte is made of a zinc compound and an organic compound with nitrogen bound to its radical, as pyridine, introducing the iron into the path with a zinc anode, and passing the current.

733,047. George F. Jaubert, Paris, France. **Hydrate of calcium peroxide.** Sodium dioxide is added to milk of lime, the mixture agitated, filtered, the precipitate washed and dried.

733,061. Leo C. Mandel, St. Louis, Mo. **Dentist tapers.** A cord saturated with a mixture of evaporated turpentine 50, sweet oil 8, and gum dammar 1 part.

733,082. Keizo Sakurai, San Francisco, Cal. **Abrasive compound.** Abrading crystals of emery 100, silica as quartz and an alkaline silicate 5 parts each.

733,110. Ernest Zuhl, Berlin, Germany. **Pyroxylin compound.** Nitrated cellulose and phosphoric acid esters of oxygenated hydrocarbons of the aromatic series, a part of whose hydrogen has been replaced by an acid radical, and the oxygen of the PO group replaced by sulphur.

733,280. Karl Schirmacher, Soden, Germany. Assignor to Farbwerke, vorm. Meister, Lucius und Bruning, Hochst-on-Main, Germany. **Red azo dye.** Ortho chlor-toluidine-*p*-sulphonic acid is diazotized and combined with *β*-naphthol, forming as a sodium salt a red powder little soluble in hot water and alcohol, soluble in concentrated sulphuric acid blue-red, in glacial acetic acid orange-yellow, precipitating brown-red flakes by mineral acids from aqueous solutions.

733,284. Otto Selg and Carl Guntrum, Brooklyn, N. Y. Making **beer.** The wort is charged with yeast and fermented nearly to completion in a closed vessel, the yeast going into a yeast pocket, then cooling the upper stratum of the vessel while kept open, by which the liquid is clarified, then removing the yeast and charging the pocket with a concentrated fermentative, closing the vessel and cooling the yeast pocket, and completing the fermentation.

733,308. Luis Wirtz, London, England. **Pigment material.** Slag, a double silicate of calcium and aluminum, is soaked in ferrous chloride with hydrochloric acid, filtered, the filtrate treated with a metallic sulphate, the precipitate separated, washed and dried.

733,316. Robert K. Duncan, Washington, Pa. Making **phosphorus.** Assignor to General Chemical Co., N. Y. Phosphides are produced from phosphatic material in an electric furnace, charged into a decomposing chamber with hydrogen and water, and decomposing the phosphorus hydride produced by heat.

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733,389. Chas. M. Hall, Niagara Falls, N.Y. **Removing silica from coke.** A metallic fluoride as sodium fluoride, cryolite, or fluor-spar is added to the carbon containingsilica and a binder as pitch, the mixture briquetted and heated till silicon fluoride is made.

733,407. Konrad N. Lundblad, Orebro, Sweden. **Belt dressing.** Linseed oil and lard oil 16 pounds each, rosin 50 and vaseline 11 pounds.

733,452. Wm. Bate, Hayle and Frederick G. Orme, London, England. **Condenser for nitric acid.** A manifold is constructed with a number of vertical U-shaped pipes surrounded by lead jackets and suitable connecting pipes for cooling water, etc.

733,465. Herbert H. Dow, Midland, Mich. **Ammonia** from ammoniacal gases. The gases are passed into a hot solution of calcium chloride, then acting on the ammonium chloride formed with an alkaline hydroxide at a temperature less than is required to volatilize the tar products therein.

733,466-7. As above for making **bromine.** The element is absorbed from bromine-laden air by ammonium bromide, and then by ammonia. May substitute chlorine for bromine in part in the first patent.

733,573. Giovanni Bevilacqua and Giuseppe Bevilacqua, Genoa, Italy. **Rust and fire-proof composition.** Asbestos 37, calcined magnesia 45, color as graphite 2.5, cork 2, pozzolana 2, and potassium silicate 45, with slag wool 7 parts.

733,578. George Egly, Charlottenburg, Germany. **Smelting metals.** Nickel, waste iron, etc., are smelted in an electric furnace the lower anode of which is kept covered with scoria.

733,590. Otto Meurer, Cologne, Germany. Obtaining **metallic sulphates** from mattes. The ore is fused, separated from the gangue, and the matte pulverized, mixed with iron bisulphide and with the sulphate of an alkali and coal, then heating the mixture in the absence of air, allowing the mass to crumble and oxidize in air, and finally washing the oxidized mass.

733,591. John F. Myers, New York, N. Y. **Polish.** Graphite, carbon tetrachloride, benzene 20 per cent., uninflammable.

733,597. George E. Reynolds, Pueblo, Colo. **Roofing compound.** Coal tar one gallon, turpentine, asphalt and gasoline, each six ounces, asbestos fiber and plumbago each half a pound, fine mica three-quarters of a pound.

733,612. Wm. J. Armbruster, St. Louis. Mo. Making **pig-**

ments. Barium hydroxide 171, zinc nitrate 189, and sodium sulphate 142 pounds.

733,662. Hjalmar Lange, Vesteras, Sweden. **Soldering aluminum.** Scour the surfaces, heat the joint and cover with molten zinc, then with aluminum-zinc alloy, then keep the surfaces in contact and heat to fuse the alloy.

733,729. George W. Miles, Belmont, Mass. Assignor to Frank L. Pierce, Trustee, Brooklyn, N. Y. **Cellulose esters.** Cellulose is treated with a mixture of acetic anhydride, sulphuric acid one-fifth of one per cent. of the glacial acetic acid used, at about 70° C., for two or three hours, the precipitate being washed with water and dried.

733,741-2. Alfred I. Dupont, Wilmington, Del. Process and apparatus for **glazing powder.** A jacketed revolving drum is provided with steam pipes to both jacket and the interior of the drum. The grained powder is rumbled till dust is formed, then the jacket is heated till the powder liberates water and takes up the dust, when the jacket is cooled, thereby condensing the moisture on the outside of the grains with the dust, and a current of air is forced through the rumble to expel any surplus moisture after the grains are glazed.

733,797. Fritz Boseuau, and Ali Cohen, Amsterdam, Netherlands. **Insulating medium.** Asphalt is melted for several days out of contact with air, then petroleum is mixed with it, a solution of 1 per cent. of aluminum hydroxide in acetic acid added, then alkali 8 per cent., and resin 7 per cent. of the whole, and the whole heated to a homogenous mixture.

733,856. Joseph W. Maxwell and John W. Sawyer, Louisville, Ky. **Extracting precious metals.** The powdered ore is treated with chlorine forced through the ore under pressure at 360° F. for one to three hours, the temperature then raised to 755° and hot hydrogen and steam passed through, hot vapor of mercury is then passed through to amalgamate floured gold, the various volatilized compounds having been collected, the ore is then treated with chlorine water, filtered, and the filtrate acted on by sodium sulphide to precipitate the chlorides as sulphides, the pulp is treated with hyposulphite of soda to dissolve silver chloride, filter and precipitate the silver with sodium sulphide, to the remaining pulp is added 60 pounds of mercury to the ton, the amalgam is drawn off, filtered, retorted, and the gold cast into bullion.

733,896. John W. Bailey, Jersey City, N. J. Assignor to Union Lead and Oil Co., N. J. Making **litharge.** Molten metallic lead is subjected to a jet of mingled steam and air.

733,918. Alida L. Rosenthal, London, England, administratrix. **Active material for accumulators.** A water solution of urea sulphate and sulphuric acid is mixed with an oxide of lead.

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733,969. William C. Johnson, Memphis, Tenn. **Bleaching cottonseed paper pulp** from cottonseed hulls. The hulls are first broken by attrition, the loose particles separated, then treating with sodium hydroxide at a high pressure and temperature, then agitating with hot water and bleach liquor of chlorine, separating out the fiber and drying it by hot air.

733,972. Patrick Kennedy, New York, N. Y. Assignor to Consolidated Electric Lighting and Equipment Co. **Frosting glass globes.** The lower end is immersed in dilute hydrofluoric acid, the air exhausted from the globe and the frosting liquid rises to the desired height, then the air is admitted and the liquid falls by gravity, the globe is washed and dried.

733,987. Frances B. Merrill, New York, N. Y. Assignor to Merrill Process Co., N. Y. **Binder for briquettes.** Coal tar is distilled with water and iron sulphate till 570° F. is reached.

734,002. Johann M. Schwarz, Eiken, Switzerland. **Bituminous briquettes.** Powdered brown coal waste and glue waste are mixed together and pressed.

734,030. Frank S. Young, Norristown, Pa. **Magnesium and calcium carbonates.** Magnesia is allowed to settle out of a mixture of water and calcined dolomite, removing and carbonating the magnesia to bicarbonate to which magnesia is added to form a carbonate. The first step is done by allowing milk of magnesia to drip through carbon dioxide gas.

734,123. Arthur Eichengrun and Theodore Becker, Elberfeld, Germany. Assignors to Elberfeld Co., N. Y. **Acetyl cellulose.** Characterized by being soluble in alcohol, its concentrated solution when cold forming a solid mass like gelatine, precipitated from its solutions in alcohol, acetone or glacial acetic acid by water.

734,164. George Dinkel, Jersey City, N. J. Assignor to the American Sugar Refining Co., N. J. Apparatus for making **lime sucrates.** A tall cylinder with hopper for lime, and a feed screw on top, and stirrer shaft in center. The sugar solution is spread in a thin sheet over a central cone, and the fine lime rubbed through a perforated plate onto this sheet.

734,168. Robert L. Gamlen, Bromley, England. **Incrustation preventative.** Distributes finely divided jute through the boiler water.

734,223. George Dinkel, Jersey City, N. J. **Lime sucrate.** See 734,164. The process of moving the sugar solution in a thin sheet, and adding finely divided lime, at successive intervals, the quantity added being always just below what the sugar can take up, and agitating the mixture.

734,239. Frank M. Pratt, Decatur, Ill. Extracting **oil from cottonseed.** The unhulled and unlinted seeds are flattened, subjected to a hydrocarbon solvent, deodorized and then delinted.

734,240. Georg C. Pfropfe, Hamburg, Germany. **Pulverizing and cleaning minerals.** They are heated, cooled and screened.

734,286. George Thomson, Elizabeth, N. J. **Compound ingot.** A casting of a steel body and a nickel-copper alloy on the face which is of greater specific gravity, merging gradually into the homogeneous steel body.

734,305. Francisque Crotte, New York, N. Y. **Preserving beer.** The beer is placed in a non-metallic porous vessel, a preservative as boric acid put in a receptacle that forms a positive electrode in contact with the beer, the opposite electrode being on the outside of the vessel and in contact with a moist sponge, and passing a high tension current, causing a cataphoric transference of the preservative from the receptacle into the beer.

734,312. Charles Fournier, Geneva, Switzerland. **Electrolytic cell.** To electrolyze alkaline chlorides, an anode compartment, having a porous wall, a plurality of superimposed separate cathode cells, each having a porous wall of greater density than the one above it, and an intermediate compartment, all connected by pipes.

734,325. Otto Hess, Hochst-on-Main, Germany. Assignor to Meister, Lucius und Bruning, same place. **Green anthraquinone dye.** Di-*p*-toluidine dihydroxyanthraquinone is sulphonated, making a dye soluble in water green, in caustic soda blue, dyeing unmordanted wool green and chrome mordanted yellow-green.

734,352. Anton J. Nesso, Norden, Germany. **Mussel extract.** Live sea mussels are repeatedly treated with salt and water, and milk, the salt being decreased and the milk increased, then heating the mussels in their own juice till the meat forms a solid mass which is separated from the shells, cleaned and boiled with the juice, the broth obtained being filtered and boiled down to extract consistency.

734,391-2. William J. Armbruster, St. Louis, Mo. Process of making a **white pigment.** Solutions of zinc chloride and barium chloride, and the hydroxide and carbonate of an alkali metal are mixed and the precipitate separated. The second patent relates to a mixture of zinc carbonate, barium carbonate and zinc sulphide.

734,397. Henry Blumenberg, Jr., Daggett, Cal. **Sulphur burner.** A long cylinder with manhole in top for sulphur supply, and an air-supply pipe outside the whole length of the cylinder, with dependent branches at intervals dropping to near the bottom of the cylinder, for a distributed supply of air.

734,454. Arno Bauermeister, Leipzig, Germany. Assignor to Carl W. G. Aarland, same place. **Photographic color filter.** Gelatine is dissolved in glycerol, a color and an antiseptic added, the mixture poured in a shallow glass trough and closed with a glass plate under pressure to cool.

734,457-8. Ernst W. Engels, Dusseldorf, Germany. **Refractory linings** of carborundum. This is mixed with a binder as water-glass and applied in a wet state to the surface of unburned bricks or as a lining coat, firmly pressed onto the surface, dried and burned on, firmly incorporating the carborundum with the body as a refractory coat.

734 482-3. Samuel R. Whitall, U. S. Army. Assignor 11/20 to Frank Macomb Whitall and Joseph R. Edson, Washington, D. C. **Wurtzilite compounds.** (A kind of asphalt). The first patent for its solution in petroleum derivatives, the second for mixtures with rubber.

734,485. Edwin Wilding and Alfred H. Stott, London, England. **Cleaner for wood.** Flour 38.5, calcium chloride 16, turpentine 0.5, and muriatic acid 0.45. The wood to be coated with the paste and after a time brushed off. The dirt comes off with the paste.

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734,522. Thomas A. Edison, Llewellyn Park, N. J. **Nickel-plating.** Iron or steel is plated with nickel electrolytically, and the articles then subjected to a welding heat in an atmosphere of hydrogen gas, and while in said gas cooling it below the oxidizing point.

734,551. Heinrich Helbing, London, England. **Cork.** An ordinary cork is soaked in an aqueous solution of casein and then treated with formaldehyde.

734,678. Almo De Monco, Denver, Colo. **Cement plaster.** Aluminous flint clay 756, silicious clay 377, plaster of Paris 866 pounds, and any fiber.

734,679. **As above** with one-half silica and color added.

734,683. John F. Duke, London, England. Obtaining **gold from sea-water.** A reservoir is dug out of a cliff by the shore, into which the water is allowed to flow at high tide, and precipitate any gold contained by contact with a haloid salt, then when the sludge has become sufficiently rich in gold, it is removed and the gold separated. Calcium carbonate is used as a precipitant. The water is run off from the reservoir at suitable intervals.

734,710. Charles Hornbostel, New York, N. Y. **Hydrocarbon burner.** A mass of fuller's clay mixed with kieselguhr is molded over perforated pipes through which the vaporized hydrocarbon oil is fed under a blast of air that forces it through the mass.

734,713. George F. Jaubert, Paris, France. **Dioxides of alkaline earth hydroxides.** A solution of an alkaline earth sulphide is caused to react on a hydrate of an alkaline dioxide.

734,743. Alfred Paul, Melrose Highlands, Mass. **Fuel compound.** Coal dust 15, sawdust 1, resin, sour beer, and molasses for binder, molded in forms.

734,849. Gustave Gin, Paris, France. Making **sulphuric acid.** The gases from sulphide ores are cooled and the dust separated, then washed with sulphuric acid and sprayed with cold water acidulated with sulphuric anhydride, the liquid is conducted on to a bed of refractory material through which hot air is continually forced.

734,866. Eduard Hepp, Frankfort-on-Main and Christoph Hartmann, Hochst-on-Main, Germany. Assignors to Meister, Lucius und Bruning, Hochst-on-Main, Germany. **Blue anthraquinone dye.** Brominated amino-anthraquinone 1-5 sulpho acid is sulphonated with para toluidine, forming a dark blue powder easily soluble in water, readily precipitated by common salt, but not by excess of carbonate or caustic soda, soluble in concentrated sulphuric acid a feeble blue, turning first red and then violet on adding ice, which separates a blue precipitate:

734,889. George Klenk, Hamburg, Germany. **Tanning extract.** Aluminum sulphate is added to crude tannin solution, then sodium bisulphite, and the mixture heated to 125° C. in a closed receptacle, and finally concentrating in a vacuum and cooled. The finished solid extract is soluble in cold water, has about 70 per cent. tannin and 22 per cent. water, with some salts, and gives no precipitate with an organic acid in a solution of 6° to 8° Beaumé.

734,899. Valentin Lapp, Lindenau, Germany. Making **wort.** The husks of malt are separated, mashed and extracted at a temperature of about 50° C. for fifty minutes, straining the liquor and adding it to that obtained from the grains.

734,950. Erwin Quedenfeldt Duisberg, Germany. Assignor to Chemische Fabrik, Griesheim Electron, Frankfort-on-Main, Germany. **Lead peroxide.** An emulsion of lead oxide is made with a concentrated solution of an alkali chloride, and the mixture electrolyzed, the mixture being kept in motion during the process.

735,018. Robert R. Hite, Wichita, Kansas. **Treating trees.** A hole is bored in them under the surface of the ground, and a mixture of methyl alcohol 1 gallon and corrosive sublimate 1 pound inserted and the hole plugged up.

735,022. Frank J. Tone, Niagara Falls, N. Y. **Refractory brick.** Granular silica is bonded together by carborundum.

WILLIAM H. SEAMAN.

REVIEW OF AMERICAN CHEMICAL RESEARCH.

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WILLIAM A. NOYES, Editor.

GENERAL AND PHYSICAL CHEMISTRY.

Ions and Nuclei.[1] BY C. BARUS.—Following the author, let the ions be regarded as charged nuclei and let there be an average of q electrons per nucleus. Let the loss of ions be due merely to absorption of the charges at the boundary of the region. This is virtually stating that the loss is as the first power of the number n, per cubic centimeter. Whether the charge travels with the nucleus, or whether it travels from nucleus to nucleus along a highway of nuclei, as it were, is left open, but the charges are lost at the boundary at a more rapid rate than the nuclei.

To fix the ideas, let a tube condenser of radii $r_2 > r_1$, and length l, be given, and let v (cm/sec) be the velocity of the air current bearing charged nuclei longitudinally through the condenser. If V is the volume of this air in liter/min entering the condenser at one end, $\pi(r_2 - r_1)v = 16.7\mathrm{V}$.

The loss of nuclear charges is then due to two causes: (1) These charges have a specific velocity, k (absorption velocity in a given cardinal direction) in the absence of the electric field. Charges are lost in pairs by this non-directed motion *without* producing current. (2) The nuclei have a second velocity, U', in the same direction per electron carried and per volt/cm of the field. Hence the number of nuclei, n, at the section l cm. from the influx end, where $n = n_0$,

$$n = n_0 \varepsilon^{-2\mathrm{K}l/v(r_2 + r_1)} = \varepsilon^{-\alpha} \quad . \; . \; . \; (1)$$

where $\mathrm{K} = k + qEU'/(r_2 - r_1)$ and $\alpha = 0.377\, l\mathrm{K}(r_2 + r_1)/\mathrm{V}$.

The radial current at the same section, if the potential difference between the surfaces r_2 and r_1 of the tube condenser is E, will not depend on k but on U', so that

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[1] Experiments with Ionized Air; Smithsonian Contributions, No. 1309, 1901. The Structure of the Nucleus, Smithsonian Contributions, No. 1373, 1903. American Journal of Science, (4) Vol. XV, 1903, p. 105, *Ibid.*, p. 217.

$$-di = 2\pi(r_2 + r_1)ne\ U'q^2(\mathrm{E}/(r_2 - r_1))dl$$

or eventually

$$-CdE/dt = \frac{16.7 \mathrm{V} n_0 e q^2 (1 - \varepsilon^{-a})}{q + k/(U'E/(r_2 - r_1))} \quad . \ . \ . \ (2)$$

where C is the capacity of the condenser and e the charge of one electron.

Experiment shows that the currents are of about the same order when charged water nuclei from an intense high pressure jet and when charged phosphorus nuclei are passing longitudinally through the condenser. But as the number of water nuclei as tested by coronas, are, even in the condensation chamber, not above 10^6 per cubic centimeter, while the number of phosphorus nuclei may reach 10^7, the charge q in electrons is large per nucleus for water nuclei and small for phosphorus. Similarly one may expect the water nucleus derived by evaporation to be larger than the initial phosphorus nucleus derived chemically, so that k is larger in the latter case.

Hence it is assumed that in case of water nuclei, k is negligible in comparison with $qEU'/(r_2 - r_1)$ and equation (2) becomes, if $qU' = U$,

$$-CdE/dt = 16.7 \mathrm{V} n_0 (eq)(1 - \varepsilon^{-0.377l(r_2 + r_1)UE/\mathrm{V}(r_2 - r_1)} \quad . \ . \ . \ (3)$$

This equation, which fits the phenomena very well, predicts saturation as the exponent is essentially dependent on E.

On the other hand, in case of phosphorus nuclei, k is large in comparison with $qEU'/(r_2 - r_1)$, for here a single electron travels with many nuclei. The exponential term in (2) vanishes or

$$-CdE/dt = 16.7 \mathrm{V} n_0 e q^2 E U'/k(r_2 - r_1) \quad . \ . \ . \ (4)$$

which is virtually Ohm's law.

The endeavor has thus been made to explain the two types of conduction in question, the charged water nucleus type and the charged phosphorus nucleus type, by the simple self-contained hypothesis given, without introducing extraneous radio-active machinery.

Assuming that k is relatively large, the author in the first memoir works out the case for plate (Chap. IV.) tube (Chap. V) and spherical (Chap. VI) condensers, the results in these cases being consistent. To observe the behavior of the nucleus in the absence of an electric field (Chap. III), the steam jet is utilized, after the nature of the evidence has been treated in detail (Chaps. I and II). In the more recent experiments with water nuclei, the author considers the case of relatively small k and the results again make a consistent series.

Whereas U is found in the usual way, to determine k it is furthermore necessary to use the condensation chamber, and preliminary investigations on the axial and the coronal colors of cloudy condensation are needed. These are considered at length in the second volume (Chaps. I, III, IV). It is the aim of these chapters to determine the number of fog particles and their size from the diffraction type and the apertures of the coronas obtained under definite conditions of exhaustion. The volume contains supplementary matter bearing on the discussion as a whole (Chap. I on nuclei and ions) and on the nuclei produced by violent agitation of solutions (Chap. V). C. BARUS.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

Chemical Composition of Igneous Rocks Expressed by Means of Diagrams with Reference to Rock Classification on a Quantitative Chemico-Mineralogical Basis. BY J. P. IDDINGS. *U. S. Geol. Survey Professional Paper No.* **18**, 98 pp.; plates.—Dr. Cross, in his letter of transmittal, says of this work: "The significance of a large number of chemical analyses of igneous rocks, with their many variable elements, each having a great range, is somewhat difficult of comprehension to all geologists and petrographers who have not devoted much time to their study. Mr. Iddings presents a method of expressing the most significant factors in each analysis by a simple diagram, and by grouping these individual diagrams on a certain principle he has succeeded in representing the great variation in composition and the chemical relationships of almost the entire range of igneous rocks in a way that is comprehensible at a glance. The facts thus brought out are discussed by him in their bearing on petrographic system. As a successful attempt at the elucidation of a complex problem the paper is of importance to all students of igneous rocks." W. F. HILLEBRAND.

Secondary Enrichment. BY FRANK H. PROBERT. *Eng. and Min. J.*, **76**, 958–959; figures.—Certain ores mined in southern Spain are cupriferous iron pyrites showing in thin section microscopic crystals of chalcopyrite in the interstices. After four years' exposure on the dumps, with periodical leaching, the chalcopyrite has disappeared, but the pyrite appears to have suffered no change whatsoever. Chemical equations are given to show the possible changes during oxidation of the chalcopyrite and a portion of the pyrite, and it is suggested that a similar set of reactions may have operated in the Clifton-Morenci district of Arizona to account for the occurrence there of chalcocite as a secondary formation. The descending sulphate solutions from the upper portions of the lean cupriferous pyrite have been reduced by the pyrite lower down, which has become either simply coated with or more or less wholly replaced by chalcocite.

W. F. HILLEBRAND.

The Age and Origin of the Gypsum of Central Iowa. BY FRANK A. WILDER. *J. Geol.*, **11**, 723–759; figures.—The author discusses the various ways in which chemical deposits may have formed, both in lakes without outlet and in those in some degree connected with the ocean, illustrated in the latter case by the Mediterranean, in endeavoring to account for gypsum deposits of such thickness and freedom from impurities as those mentioned in the title. Admitting the question to be far from definitely settled, for lack of sufficient data relating to the reactions taking place between salts in solution during the process of brine concentration, the author inclines to the Mediterranean hypothesis, with certain modifications pointed out in his paper. "Although there may be some doubt as to the exact manner in which the calcium carbonate is removed from the brine during concentration, the fact that it is removed in some one or more of the ways suggested, or by some process not yet brought to light, may be assumed. This removes the only serious difficulty in conceiving of extensive and very pure deposits of gypsum forming in basins only slightly, yet continuously through long periods, connected with the ocean." W. F. HILLEBRAND.

The Chemistry of Ore-Deposition. BY JOHN A. CHURCH. *Trans. Am. Inst. Min. Eng.* (Advance extra, November, 1903, 6 pp.)—The author adduces examples from his own varied experience in support of Walter P. Jenney's views (abstract this Journal, **25**, R 213) on the important role played by carbon in ore deposition. W. F. HILLEBRAND.

Ore Deposits Near Igneous Contacts. BY W. L. AUSTIN. *Trans. Am. Inst. Min. Eng.* (Advance extra, November, 1903, 8 pp.)—The character of the Cananea (Mexico) ore bodies is discussed and objection raised to certain of Mr. Weed's conclusions (Trans., 33, 715; abstract this Journal, **25**, R 346), especially his classification of them under the subheading "Deposits Impregnating and Replacing Beds of Contact Zone." The author shows that "by far the greater part of the copper produced by the mines of La Cananea has come from masses of mineralized porphyry and not from" ore bodies practically confined to metamorphosed limestones. W. F. HILLEBRAND.

The Mineral Waters of Indiana, Their Location, Origin, and Uses. BY W. S. BLATCHLEY. *26th Ann. Rep. Dept. Geol. and Nat. Resources, Indiana*, pp. 11–158; plates. Some of the numerous analyses are new. W. F. HILLEBRAND.

The Medicinal Properties and Uses of Indiana Mineral Waters. BY ROBERT HESSLER. *26th Ann. Rep. Dept. Geol. and Nat. Resources, Indiana*, pp. 159–224. W. F. HILLEBRAND.

Gold and Diamonds in Indiana. BY W. S. BLATCHLEY. *27th Ann. Rep. Dept. Geol. and Nat. Resources, Indiana*, pp. 11–47;

plates; map.—Both minerals occur, but are of glacial, not native, origin, having, probably, been transported from Canada.
W. F. HILLEBRAND.

List of New York Mineral Localities. BY H. P. WHITLOCK. *Bull. No. 70, New York Sta. Mus.*, 108 pp.
W. F. HILLEBRAND.

Ramosite Not a Mineral. BY LEA McI. LUQUER. *Am. J. Sci.*, 17, 93–94.—Optical examination of this ferric-aluminum-calcium-magnesium silicate shows it to be merely a basic scoria of unusual hardness. W. F. HILLEBRAND.

Bedford (**New York**) **Cyrtolite.** BY LEA McI. LUQUER. *Am. Geologist*, 33, 17–19.—This material, found in pockets in a feldspar quarry, possessed the characteristics and general composition of some cyrtolites from other localities, but was evidently too much altered to warrant a detailed analysis. The very dark color and higher specific gravity of the central core, as compared with the outer portions of the crystalline masses, are due to abundant inclusions of uraninite. Other minerals new to the locality are beryl and uraconite, the latter formerly reported as uranotil. W. F. HILLEBRAND.

Report of an Analysis of the Waters of the Hot Springs on the Hot Springs Reservation, Hot Springs, Garland County, Arkansas. BY J. K. HAYWOOD. *Senate Document No.* **282**, *Fifty-Seventh Congress, First Session*, pp. 1–78. Washington: Government Printing Office.—The unusual medium of presentation for a paper of this kind must be the reviewer's excuse for such a belated notice of the most noteworthy contribution to our knowledge of American mineral waters that has appeared since the work of Gooch and Whitfield on the waters of the Yellowstone National Park. The waters of the Arkansas Hot Springs have been analyzed before, but not in the painstaking and exhaustive manner followed by Mr. Haywood. Analyses of 46 of the 49 existing springs are reported. The dissolved gases (O, N, and CO_2 free and as bicarbonate), nitrates, oxygen-consuming capacity, and free and albuminoid ammonia were determined on the spot within an hour after collecting the samples. The rest of the analysis was made in the laboratory of the Bureau of Chemistry, Department of Agriculture, at Washington, D. C. Temperatures are given in all cases. The methods followed are described and there is a brief statement of the medicinal value ascribed by the best authorities to the various constituents usually present in mineral waters.

The composition of these thermal waters is, with four exceptions, extraordinarily alike. The total mineral matter in solution for all the springs is between 275 and 280 parts per million, seldom falling below 270 or exceeding 290. Of the four exceptions No. 12, with 170.1 parts per million is nearly cold, No. 20 contains 231 parts per million, No. 27 contains 258.7 parts per million, and No. 43 has the relatively large amount of 310 parts per million of mineral matter. Yet even in these cases there is practically no variation in the nature of the constituents and not enough in their relative proportions to make any difference, in the author's opinion, in their medicinal value, with the exception of the little Geyser Springs, "which is markedly weaker in medicinal constituents than the other springs," and the Reservoir Spring, which is much richer in laxative salts. The following data on the water from the Big Iron Spring, with a daily flow of 201,600 gallons, are typical of the whole.

Gases (number of cubic centimeters per liter at 0° C. and 760 mm. pressure).—Nitrogen, 8.80; oxygen, 3.79; carbon dioxide (free), 6.92; carbon dioxide (set free from bicarbonates on evaporating to dryness), 30.02; hydrogen sulphide, none. Temperature, 63.9° C., on November 24, 1900, and again on January 7, 1901.

	Parts per million.	Per cent. of total inorganic material in solution.	Amount of water used for each determination. cc.
SiO_2	45.59	16.00	10,000
SO_4	7.84	2.75	4,000
HCO_3	168.10	59.02	100
NO_3	0.44	0.16	100
NO_2	0.0016	....	100
PO_4	0.05	0.02	8,000
BO_2	1.29	0.45	6,750
AsO_4	none	....	5,000
Cl	2.53	0.89	700
Br	trace	....	8,000
I	"	....	8,000
Fl	none	....	15,000
Fe Al	0.19	0.07	8,000
Mn	0.34	0.12	4,000
Ba	trace	....	15,000
Sr	"	....	6,000
Ca	46.93	16.48	4,000
Mg	5.10	1.79	4,000
K	1.60	0.56	4,000
Na	4.76	1.67	4,000
Li	trace	....	4,000
NH_4	0.040	0.02	500
Total	284.8016	100.00	
Total solids	198.50	....	200
Albuminoid ammonia	0.035	....	500
Oxygen required	0.55	....	200

Hypothetical combinations.	Parts per million.	Per cent. of total inorganic material in solution.
NH_4Cl	0.119	0.04
$LiCl$	trace	....
KCl	3.05	1.07
$NaCl$	1.65	0.58
KBr	trace	....
KI	"	....
Na_2SO_4	10.06	3.54
$MgSO_4$	1.30	0.46
$SrSO_4$	trace	....
$BaSO_4$	"	....
$NaBO_2$	1.98	0.66
$Ca_3(PO_4)_2$	0.08	0.03
$NaNO_3$	0.60	0.22
$NaNO_2$	0.0024	....
$Mg(HCO_3)_2$	29.14	10.23
$Ca(HCO_3)_2$	189.95	66.68
$Mn(HCO_3)_2$	1.09	0.38
Fe_2O_3 Al_2O_3	0.27	0.09
SiO_2	45.59	16.01
Total	284.8814	100.00

(See following abstract.) W. F. HILLEBRAND.

Geological Sketch of the Hot Springs District, Arkansas. BY WALTER HARVEY WEED. *Senate Document No. 282, Fifty-Seventh Congress*, pp. 79–94; maps; plates. Washington: Government Printing Office.—The situation and geological relations of the springs are briefly described. The small amount of mineral matter in the waters, as revealed by Mr. Haywood's analyses (see preceding abstract), is regarded as evidence of their meteoric origin, also the fact that they contain oxygen and nitrogen in nearly the atmospheric ratio. The underlying Silurian sediments "are competent to supply all the mineral matter of the waters." Their heat is supposed to be derived from vapors rising through fissures from a great body of still heated igneous rocks underlying a large part of central Arkansas. The total present daily outflow is 850,000 gallons, carrying 1367 pounds of mineral matter, or 249.5 tons a year. Comparison of the analyses of Haywood with earlier ones, made in 1859 and 1889, reveals no essential difference in composition. It is concluded that the temperature of the waters is slowly falling, but so slowly that the fall is almost inappreciable. W. F. HILLEBRAND.

Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for the Year 1902. BY F. B. WEEKS. *U. S. Geol. Survey Bull. No.* **221**, 200 pp..
W. F. HILLEBRAND.

The Appalachian Coal Field. BY I. C. WHITE. *West Virginia Geological Survey, Vol. II*, 1903, pp. 81–725.—This extensive report contains a vast number of proximate analyses of coals and determinations of sulphur, phosphorus, and calorific value. They were made chiefly by Prof. B. H. Hite and assistants of the State Agricultural Experiment Station, though many are from other sources, especially of the Pittsburg coal in the Fairmont region by Frank Haas. The latter contributes a special paper on the coal of the region just named, and Mr. Charles Catlett another on the Pocahontas-New River-Gauley coals. Tabulations frequently reveal interesting variations in the composition of the same widely extending seam. It may be mentioned that the calorific measurements made by Prof. Hite with the Parr calorimeter run uniformly lower by about 500 B.T.U. than those by Mr. Haas with the Mahler bomb, a result which was confirmed by the few tests subsequently made with the Williams bomb-calorimeter.

W. F. HILLEBRAND.

On the Differentiation of Igneous Magmas and Formation of Ores. BY J. F. KEMP, *Eng. Min. J.*, **76**, 804, and BLAMEY STEVENS, *Eng. Min. J.*, **77**, 71–72.—An earlier paper by Mr. Stevens in the above Journal, **76**, 574 (this Journal, **26**, R 5) on the "relation of rock segregation to the ore deposition," called forth from Professor Kemp a brief summary of the essential points of the diverse views hitherto advanced to account for magmatic differentiation, in which he raised objection to the theory o Mr. Stevens. The latter in reply supports his contention by a simple experiment and draws attention to certain misconceptions regarding plastoids. W. F. HILLEBRAND.

Producing Capacity of the United States. *Iron and Mach. World*, December 26, 1903.—By carefully checking off the records of the American Iron and Steel Association, and comparing them with the present rate of output, the conclusion is reached that the present producing capacity yearly is, in tons, as follows: Iron ores, 35 millions; coke, 26 millions; pig iron, 29 millions; steel 22 millions. New plants being erected will increase the capacity for pig iron and steel each 3 million tons. J. W. RICHARDS.

The Mineville Magnetite Mines. *Iron Age*, December 17, 1903.—A long, illustrated description of these famous Port Henry mines, with an account of the present magnetic concentration plant. Wenstrom, Rowand, Ball and Norton, and Wetheril machines are all in use. The capacity is 800 tons daily, 85 per cent. being recovered as iron concentrates, carrying 59.59 per cent. of iron and 1.74 per cent. of phosphorus, while 15 per cent. is half first grade apatite rock, carrying 12.71 per cent. of phosphorus, and half second grade rock, carrying 8.06 per cent. of phosphorus. These tailings find a ready market with the makers o superphosphates. Each of the above types of machines has its strong points, which makes it best for a certain class of ore.

J. W. RICHARDS.

Hearth Area and Number of Tuyeres in Blast-furnace Practice. BY F. L. GRAMMER. *Iron Age*, December 10, 1903 (read before Am. Inst. Mining Eng.).—As far as assisting blast-pressure is concerned, not much is gained beyond the use of 8 tuyeres. Using coke and a moderate quantity of fine ore, for the same volume of air blown in, and hearth area, the blast-pressure using 16 tuyeres will be 1 to 2 pounds higher than with 8 ; the cause is the increased friction. Best results on Lake Superior ores have been obtained in an 85-foot furnace, with a 11- or 12-foot hearth, and 8 tuyeres, giving 12 square feet of hearth area to a tuyere. The average size of furnace now operating in the United States, on Lake Superior ores, is 20 to 30 cubic feet total volume per ton of metal produced in twenty-four hours, and 3 to 3.5 cubic feet of hearth capacity. J. W. RICHARDS.

Iron Metallurgy in the Philippines. *From Bulletin 3, The Mining Bureau, Manila.* BY H. D. MCCASKEY. *Iron and Mach. World*, December 26, 1903.—The industry is confined to the province of Bulacan. The furnaces are built up of sun-baked fire-clay bricks, or of solid fire-clay, in one piece, dried and bound round with rattan thongs or iron. The hearth is shallow and nearly circular, 2 feet 4 inches in diameter and 4 to 6 inches deep. The total height is 7 feet 5 inches, inside 6 feet, thickness of walls 1 foot inside diameter at top 2 feet 8 inches. The tuyere is a fire-clay pipe 2 feet 7 inches long, 6 inches outside diameter and 1.5 inches inside. The blower is the hollow, cylindrical trunk of a tanguile tree, with semicircular valves of leather and wood. The piston is packed by a double row of feathers; the piston rod is 15 feet long and has a double handle. The ore is broken to lumps 1.5 inches large, and the smelting is done by charcoal, one basket of ore being charged to four of charcoal. The slag is drawn off every two or three minutes, and casts are made every two or three hours. The iron is run out into a casting ladle of fire-clay bound with iron, 8 by 6 inches diameter inside and 6 inches deep, and poured directly into molds for castings. A modern furnace could be operated at a handsome profit.

J. W. RICHARDS.

The Ferro-Metals and Their Electrical Manufacture. BY A. J. ROSSI. *Iron Age*, November 12, 1903.—*Spiegeleisen* and *ferro-manganese* are made in a blast-furnace. Ferro-silicon can be made in the blast-furnace up to 12 or 14 per cent. silicon ; above that the electric smelting is necessary, and alloys up to 50 per cent. or more are made commercially. *Ferro-nickel* has been made in the blast-furnace, but its use has been displaced by that of pure nickel. *Ferro-chromium* with 65 per cent. or more of chromium is made in the electric furnace. *Ferro-molybdenum* may be made directly in the electric furnace from a charge of iron ore, molybdenite and carbon. *Ferro-tungsten* with 76 to 78 per cent. of tungsten and *ferro-titanium* with 4 to 75 per cent. of titanium may be made in the electric furnace. All these alloys contain 3 to 8 per cent. of carbon, except ferro-silicon. Good chromium ore costs $25 per ton; tungsten concentrates with 60 to 70 per cent. of tungstic acid, 8 cents per pound; vanadic acid concentrates and molybdenite cost 45 to 50 cents per pound. Titaniferous iron ores with 10 up to 40 per cent. of titanium do not cost more than iron ores, and are generally below the Bessemer limits in sulphur and phosphorus. If titanium ore free from iron is desired, the titanic ore is mixed with enough carbon to reduce the iron ore present, and smelted in an electric furnace. The iron reduces to cast iron containing some titanium, leaving the melted mass free from iron and containing as much as 70 per cent. TiO_2. Production of the ferro-alloys by aluminum powder is too expensive, the latter costing 70 cents per pound in ton lots; by heating a bath of aluminum in an electric furnace and shoveling upon it the oxides to be reduced, the reaction is immediate and complete. With 11 horse-power of electric current, the writer has made 650 pounds of 76 per cent. ferro-tungsten in 30 minutes, the alloy containing no unused aluminum, whereas an alloy made by the Goldschmidt method, with powder or finely divided aluminum, carries 6 to 10 per cent. of aluminum, which is frequently objectionable, unless removed by iron oxide while the alloy is melted. A summary of the uses of these ferro-alloys follows. J. W. RICHARDS.

Alloys Used for Steel Making. BY J. OHLY. *Mines and Minerals*, October and December, 1903.—The alloys in question are those of iron with Ni, Cr, Co, Cr and Ni, W and Ni, Na, Al, W, Si, P, Mo, Ti, Mn, V, B, W, and alloys of Mo and Ni, and Cu and Si. They are added to the steel bath either in lump or powder, but preferably enclosed in cast-iron tubes. The metals inclined to form nitrides, and thus to eliminate nitrogen from the steel, are Ni, Cr, Co, W, Mo, Ti, V, B. *Ferro-nickel* carries 25 to 75 per cent. of nickel, with 0.75 to 1.00 of carbon, 0.20 to 0.30 silicon, 0.01 to 0.03 sulphur and 0.02 to 0.03 phosphorus. *Ferro-chrome* is made by reducing chromite in the electric furnace, the alloy thus produced carrying 70 per cent of chromium, with 8.5 to 9.8 carbon, 1.5 to 1.9 silicon, 0.02 to 0.03 phosphorus, and 0.005 to 0.05 sulphur. It costs $200 per ton. *Ferro-cobalt* is a recent alloy not in much use. *Ferro-chrome nickel* was first used in France in 1891; it contains about 74 per cent. chromium, 24 nickel, 2 to 2.5 iron, 0.75 to 1.00 carbon and 0.25 to 0.50 silicon. *Ferro-tungsten nickel* contains about 74 per cent. tungsten, 24 nickel, and iron, carbon and silicon like the preceding. *Ferro-tungsten* contains usually 84 per cent. tungsten, 11 iron, 3.2 carbon, 1.9 silicon, 0.1 phosphorus and 0.1 sulphur. It has entirely replaced the use of 95 to 98 per cent. powdered tungsten, which was so wasteful in getting incorporated with the steel. The ferro-alloy is always enclosed in a cast-iron tube. *Ferro-phosphorus* is used for increasing the phosphorus in steel for rolling into tin-plated blanks, as it decreases their tendency to stick together in the rolls; high phosphorus steel also works well in automatic screw-cutting machines, making the steel softer, brilliant and smooth in finish. *Ferro-molybdenum* is used extensively, carrying 50, 70, 75 and 85 per cent. of molybdenum; used in cast-iron tubes like ferro-tungsten. *Molybdenum-nickel* is preferred in many cases to the preceding, as it is more easily fusible. It contains ordinarily 50 to 75 per cent. molybdenum, 25 to 50 nickel, besides 2 to 2.5 iron, 1 to 1.5 carbon and 0.25 to 0.50 silicon. Steel with both molybdenum and nickel is very ductile, and is particularly suited for wire-drawing and plates for high-pressure boilers. The addition of 1 per cent. of molybdenum to the hardest chrome-nickel steels makes them readily machinable. J. W. RICHARDS.

Preventing Pipes and Blow-Holes in Iron and Steel. BY F. C. WEBER. *Iron Age*, November 12, 1903.—By using $^1/_2$ to 1 pound of ferro-boro-titanium, and 2 to 5 pounds of a 20 per cent. ferro-titanium per ton of steel, it is claimed that the metal is perfectly deoxidized, free from intermingled slag and admixed gases. The boron reduces oxides of iron or manganese, and unites with silica to form a very fluid slag; the titanium unites with nitrogen to form nitride. The statement is made that this treatment makes a gray cast iron of a quality very near to that of soft steel! J. W. RICHARDS.

Testing Ores by Vanning. BY R. PEARCE. *Eng. Min. J.*, December 24, 1903.—A description of the Cornish vanning shovel, the method of using it, and illustrations of results on testing various gold, silver, tin and copper ores.

J. W. RICHARDS.

The New Flues and Stack at Anaconda. *Eng. Min. J.*, December 24, 1903.—The colossal flues and stack at the Washoe plant have been completed. There is a blast-furnace flue 1,653 feet long, a reverberatory furnace flue 842 feet long, a roaster flue 488 feet long, a converter flue 703 feet long, and a main flue into which these lead, having a hopper-shaped bottom. The latter is 60 feet wide, 20 feet high, and 2,000 feet long. The chimney is 30 feet inside diameter and 300 feet high, and was built in sixty-seven working days. J. W. RICHARDS.

Regenerative Copper Smelting Furnaces. BY H. O. HOFMAN. *Eng. Min. J.*, December 10, 1903 (read before the American Institute of Mining Engineers).—These are quite similar to open-hearth steel furnaces, with six gas producers to one furnace, gasifying 60 to 75 tons of coal per twenty-four hours. The furnace hearth is 42 ft. 6 in. by 15 ft. 9 in. The regenerative chambers for air and gas contain 4,900 and 4,200 square feet of heating surface respectively. It takes three weeks to heat up a new furnace and make the bottom. The charge is 150 tons per twenty-four hours, or 0.218 ton per square foot of hearth, which is about double the capacity of direct-fired furnaces. The coal used is one-half the weight of the charge; it contains 17 to 30 per cent. of ash. The concentration is 3.5 to 1. The matte is 50 per cent. copper; the slags 42 per cent. silica, 42 per cent. iron and manganese oxides, 11 per cent. alumina and 0.58 per cent. copper. J. W. RICHARDS.

Contact Resistances and Current Leakages in Electrolytic Copper Refining. BY B. MAGNUS. *Electrochemical Industry*, December, 1903.—The average of many readings showed that 22.5 per cent. of the voltage drop for a tank was lost at the contacts, which were in succession, bus-bar to anode rod, to anode hanger, to anode, and cathode to cathode hook, to cathode rod and to bus-bar. The current ampere efficiency averaged 91.5 per cent. The leakages of current were from tank to tank, or row to row, or from tanks to the ground. Diagrams are given showing these leakages at various parts of the plant.
J. W. RICHARDS.

The Electric Conductivity of Commercial Copper. BY L. ADDICKS. *Electrochemical Industry*, December, 1903 (read before the American Institute of Electrical Engineers).—The chemical impurities are oxygen, mostly as Cu_2O, arsenic, antimony, and sometimes bismuth. Arsenic and antimony have similar effects, reducing the conductivity 5 per cent. for each 0.01 per cent. present. Copper shows its maximum conductivity with 0.055 per cent. of oxygen remaining in it; if this is reduced by over-poling to 0.022 per cent., the conductivity is reduced to 0.5 per cent., or as much as is produced by an increase of oxygen from 0.055 to 0.088 per cent. From the latter point, increase of oxygen, presumably then present as Cu_2O, decreases conductivity 5 per cent. for 0.26 per cent. of oxygen thus contained. Details are also given of relation of conductivity to annealing, casting, quenching and mechanical working. J. W. RICHARDS.

Production of Copper, Nickel and Zinc from Chloride Solutions. BY W. KOEHLER. *Electrochemical Industry*, November and December, 1903.—A historical sketch of the electrochemical production of these metals using chloride solutions, describing and illustrating the processes and apparatus of Body, Cohen, Hoepfner, D. H. Browne and Frasch. J. W. RICHARDS.

Cobalt-Nickel Arsenides and Silver in Ontario. BY W. G.

MILLER. *Eng. Min. J.*, December 10, 1903.—The recently discovered ore bodies lie about 90 miles northeast of Sudbury, and five miles south of Haileybury. The first is a vein 8 inches wide, filled with smaltite, niccolite, native silver, cobalt bloom, and some dyscrasite. The latter deposits consist of smaltite, safflorite and niccolite, the massive ore being 14 inches wide, and the vein 2 feet. J. W. RICHARDS.

New Types of Brass Melting Furnaces. *Metal Industry*, December, 1903.—The tilting type of furnace is the favorite, preferably fired by oil. Some use crucibles, but these remain in the furnace permanently, so that their life is greatly prolonged. Illustrated descriptions are given of the Paxon-Brown, Steele, Vosburgh, Westinghouse, Piatt, Harvey, Charlier, Lunkenheimer, Orbison, and Swartz furnaces. Many of these are suitable for melting other metals than brass, and for conducting various metallurgical operations, so that the article will interest all metallurgists. J. W. RICHARDS.

New Zinc Fields in Wisconsin. *Iron and Machine World*, December 5, 1903.—In southwestern Wisconsin, 21 concentration mills have been erected in the last two years. The extensive zinc beds lie below the lead formations; the ore is not so pure as Joplin ore, carrying more iron and requiring better concentration methods. The mineralized area extends into northern Illinois and Iowa. J. W. RICHARDS.

The Removal of Nickel Coating from Iron. BY C. F. BURGESS. *Metal Industry*, November, 1903.— If the iron to be stripped is used as anode in a sodium nitrate solution, using a current density of 30 amperes per square foot, for thirty to sixty minutes, the surface acquires a blistered appearance, and the nickel can be stripped off in the form of a thin sheet, leaving the iron clean. The nickel coating seems to be porous to the oxygen liberated at the anode, causing the adherence to be destroyed at its contact with the iron. Sodium chromate solution does not act satisfactorily. Sheet copper cathodes are used. The nitrate solution is kept neutral or slightly acid by the occasional addition of nitric acid. J. W. RICHARDS.

Casting Sterling Silver in Sand. BY D. C. MACHON. *Metal Industry*, November, 1903.—Casting in molds made of plaster of Paris and asbestos is best, but casting in sand gives results nearly as good. Fine French sand is used, with a charcoal facing. Broad shallow gates are used for light work, and thin narrow gates on heavy work. The mold is dried in a steam oven and smoked. The metal is melted in crucibles under a cover of charcoal; it should not be too hot, nor left too long in the fire. A gas furnace works well. The alloy contains 92.5 silver and 7.5

copper, melted together under charcoal and stirred. Overheating causes blow-holes; too cold metal or too slow pouring causes flaking and cracking. J. W. RICHARDS.

Slimes Process at the Consolidated Mercur Gold Mines. BY G. MOORE. *Eng. Min. J.*, December 5, 1903.—In using filter presses to separate the cyanide solution, after agitation of the slimes, the labor cost is high, and much gold solution is left in the cakes. At the above mill, Moore process filters are used, consisting of a series of parallel plates 4 inches apart, each plate being a light framework 20 feet long by 4 feet high, with canvas on both sides. Eighteen of these parallel plates form a basket of filters having a total filtering surface of 2,880 square feet. A suction-pipe passes to within 0.5 inch of the bottom of each plate. The basket of filters hangs by eight wire cables, and is lowered into a tank containing slimes by an electric crane. After suction has been on one or two hours, there is a coating of slimes 0.75 to 1 inch thick on all parts of the filtering surface, representing 9 to 12 tons of dry slimes. The basket is then raised, and lowered next into the cyanide solution, where it remains twenty minutes; afterwards it is ten minutes in the wash-water tank. After treatment, the filter is suspended above dump cars, and a slight pressure is substituted for the inside suction, when the slimes drop cleanly, in about one minute. Each filter handles 75 tons per day, and one man operates four. A 75 horse-power motor does the lifting, and the pumps give 18 to 20 inches of mercury suction. The labor cost, for treatment, is 3 cents per ton. The tailings contain 20 to 40 cents worth of gold per ton. J. W. RICHARDS.

Smelting Tin Ore in Alaska. *Iron and Machine World*, November 7, 1903.—The Bartelle Tin Manufacturing Company is said to have discovered a ledge of tin ore 262 feet wide near Tin City, Cape Prince of Wales, and is preparing to erect a five-stack smelter, with stamp mill and concentrator, having a capacity of 50 tons of tin daily. The ore runs 3 up to 70 per cent. tin, and contains also some tungsten and uranium minerals.

J. W. RICHARDS.

Tin Ore in Colorado. *Iron and Machine World*, December 12, 1903.—Tin ore has been found on land belonging to the Pueblo and Beulah Railroad Company in the Greenhorn Mountains near Beulah, Col., and will be exploited as soon as the railway is in operation. J. W. RICHARDS.

Uranium. *Iron Age*, November 5, 1903.—The Welsh-Loftus Uranium and Rare Metals Company of Buffalo will build a laboratory for the treatment of uranium ores, with a view to the commercial production of radium, and other rare metals. The company owns deposits of uranium ore in Utah.

J. W. RICHARDS.

A New Source of Corundum. *Iron and Machine World*, December 26, 1903.—The Minnesota Abrasive Company is erecting a concentrating plant at Crystal Bay, on the north shore of Lake Superior, 60 miles northeast of Duluth, and will ship their concentrates during the next season. J. W. RICHARDS.

Aluminothermics. BY H. GOLDSCHMIDT. *Electrochemical Industry*, November, 1903.—A lengthy, illustrated account of the production of pure metals free from carbon, and of the well-known welding process, based on using powdered aluminum. The article closes with description of a new application of "thermit," *viz.*, the immersion of an iron box containing the mixture of iron oxide and aluminum, and fastened on the end of a rod, into melted cast iron or steel in a ladle, or into the upper part of an ingot of unsolidified steel. Five kilos of thermit will treat a 10 to 20 ton ingot, and render the top solid and free from the ordinary piping cavity. J. W. RICHARDS.

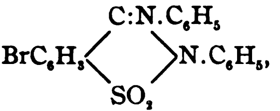
The Effect of Organic Matter on Electro-plating Solutions. BY E. S. SPERRY. *Metal Industry*, December, 1903.—Certain varieties of organic matter alter the character of the metal deposit. Benzoic acid added in extremely small amounts to a copper sulphate solution changes a dark colored and granular deposit to one bright and tough. Gelatine also acts very favorably in an acid copper sulphate bath, 1 part in 30,000,000 of bath causing an improvement. A solution of gelatine in dilute nitric acid is employed, and no more than the above amount should be used. An infusion of oak-wood has a similar effect, and also prevents the deposition of antimony. Grape-sugar is added to the zinc sulphate bath; carbon bisulphide in the solution makes a silver deposit bright and smooth. J. W. RICHARDS.

ORGANIC CHEMISTRY.

On Substituted Benzhydrol Derivatives and Bromcyanacetic Ether. BY N. E. GOLDTHWAITE. *Am. Chem. J.*, 30, 447–470. —*Part I. On Substituted Benzhydrol Derivatives.* Experiments were conducted with the two isomeric dibromdiphenylmethanes $(C_6H_4Br)_2CH_2$, to determine the relative yield of the two when diphenylmethane is brominated at low temperatures, and also to ascertain the position of the bromine atoms. Derivatives of the type $(C_6H_4Br)_2CHX(X=Br, OH, OCOCH_3$, etc.) lose HX at temperatures varying from 165° to 300°. *p-Dibromdiphenylmethane*, $(C_6H_4Br)_2CH_2$, is the main product (70 per cent.) when diphenylmethane is brominated at low temperatures and in presence of iodine. Smaller amounts of the *o-p-* (27 per cent.) and *o*-compounds are formed at the same time. The *p*-body is best crystallized from low-boiling ligroin. It melts at 64°. *p-Dibromdi-*

phenylmethylbromide, $(C_6H_4Br)_2CHBr$, is obtained by further bromination of the latter substance at 150°. It forms white needle-like crystals, m. p. 106°–107°, which give a deep red color with concentrated sulphuric acid. Heated to 165° in absence of air, it breaks up quantitatively into *p*-tetrabromtetraphenylethylene and hydrobromic acid; heated above its melting-point in a stream of dry air, it is largely oxidized to *p*-dibrombenzophenone; treated with water under proper conditions, it yields *p*-dibrombenzhydrol ether; with sodium acetate, *p*-dibrombenzhydrol acetate is obtained, while alcohol or sodium ethylate converts it into *p*-dibrombenzhydrol ethyl ether. *p-Dibrombenzophenone*, $(C_6H_4Br)_2CO$, can be obtained in theoretical yield by oxidizing *p*-dibromdiphenylmethane or *p*-dibrombenzhydrol with chromic acid in glacial acetic acid solution. It forms long, flat, pearly crystals (from ligroin), m. p. 172°–173°, and has been reported by previous investigators. Its oxime crystallizes from alcohol in two distinct crystalline modifications, one consisting of long slender needle-like crystals, the other of flat rhombic ones. Both forms melt at 150°–152°. Reduced in acid solution, it gives some of the hydrol, together with a crystalline substance (m. p. 158°–161°), possibly the pinacone. *o-p-Dibrombenzophenone*, obtained by oxidation of the corresponding benzhydrol, melts at 50°–52°, and is identical with the compound described by Heidenreich. *p-Tetrabromtetraphenylethylene*, $(C_6H_4Br)_2C:C(C_6H_4Br)_2$, melts at 248°, and does not add hydrogen or bromine. *p-Dibrombenzhydrol Acetate*, $(C_6H_4Br)_2CH.OCOCH_3$, crystallizes from ligroin in short, fine needle-like crystals, m. p. 70°–72°. With concentrated sulphuric acid it gives a deep red color; heated with water or with alcoholic potassium hydroxide, it is changed to the free hydrol. *p-Dibrombenzhydrol*, $(C_6H_4Br)_2CHOH$, crystallizes from a mixture of ligroin and ether in long, fine, white needles, m. p. 115°–116°. With concentrated sulphuric acid it gives a deep red color; with concentrated sulphuric acid and alcohol, the ethyl ether is produced; with concentrated sulphuric acid and benzene, *p*-dibromtriphenylmethane results; with oxidizing agents, *p*-dibrombenzophenone is obtained; heated with acetic acid, the acetate is produced; by the action of heat, according to the conditions, it yields *p*-tetrabromtetraphenylethane, *p*-tetrabromtetraphenylethylene, *p*-dibrombenzophenone, *p*-dibromdiphenylmethane or *p*-dibrombenzhydrol ether. *p-Dibrombenzhydrol Ether*, $(C_6H_4Br)_2CH.O.CH.(C_6H_4Br)_2$, is best prepared by heating *p*-dibromdiphenylmethylbromide with water and calcium carbonate at 120°. It melts at 155°–156°, gives a red color with concentrated sulphuric acid, and is changed to the hydrol acetate when heated with acetic acid. *p-Dibrombenzhydrol Ethyl Ether*, $(C_6H_4Br)_2CH.O.C_2H_5$, from *p*-dibromdiphenylmethylbromide and alcohol or sodium ethylate, forms a thick colorless oil, b. p. 228° at 16 mm., gives a deep red color with concentrated sulphuric acid, and breaks down at 300° into alcohol, ethylene(?), *p*-dibrombenzophenone and *p*-dibromdiphenylmethane. *p-Dibromtriphenylmethane*, $(C_6H_4Br)_2CH.C_6H_5$, crystallizes in fine needles, almost white, and melting sharply at 100°. *Part II. On Bromcyanacetic Ether,* $BrCH(CN)COOR$, *and its Conversion by Loss of Hydrobromic Acid into Dimolecular or Trimolecular Cyanmethylenecarboxylic Ether,* $ROOC(CN)C:C(CN)COOR$ *or* $ROOC(CN)C\equiv$. *Bromcyanacetic Ether*, prepared by the action of bromine upon cyanacetic ether at 150°, is a colorless oil, b. p. 195°–200°, 110°–112° at 18 mm., which liberates iodine from aqueous solutions of KI. It was converted into the *di-* or *trimolecular cyanmethylenecarboxylic ester*, (1) by means of sodium, (2) by means of sodium cyanacetic ether, (3) by means of sodium acetoacetic ether and of sodium malonic ether, and (4) by the action of aniline. This di- or tri-molecular ester melts at 122°, is sparingly soluble in cold ether and ligroin, but quite soluble in chloroform or hot benzene. M. T. BOGERT.

The Chlorides of *p*-Brom-*o*-Sulphobenzoic Acid and Some of their Derivatives. BY WILLIAM M. BLANCHARD. *Am. Chem. J.*, 30, 485–517.—*Part I. Acid Potassium Salt of p-Brom-o-sulphobenzoic Acid.* *p*-Bromtoluene was treated with fuming sulphuric acid at 40°, the mixed sulpho acids changed to potassium salts, the salt of the *p*-brom-*o*-toluene sulphonic acid separated and oxidized with permanganate to the neutral salt of *p*-brom-*o*-sulphobenzoic acid. By concentrating the aqueous solution of this neutral salt and adding sufficient hydrochloric acid, the difficultly soluble acid salt was precipitated, which yields the *Symmetrical Chloride* (m. p. 99°–100°) when treated with phosphorus pentachloride. *The Unsymmetrical Chloride* was prepared by heating the neutral potassium salt with phosphorus oxychloride in a sealed tube at 130°. When pure, it melts at 89°–90°. The results of the investigations of these two chlorides are summarized by the author as follows: 1. Ammonia with the symmetrical chloride gives only *p*-brombenzoic sulphinide; with the unsymmetrical, it gives the sulphinide and ammonium *p*-brom-*o*-cyanbenzenesulphonate. 2. Aniline in the cold gives the anil and the fusible anilide with the symmetrical chloride; with the unsymmetrical, it gives the fusible and the infusible anilides. Both anilides yield the same dianil when dehydrated. 3. The anil may be changed to the infusible anilide by passing through the fusible anilide and the dianil. On the other hand, the infusible anilide can be converted into the anil through the dianil. 4. Neither chloride is appreciably decomposed when heated to fusion for several days in a sealed tube, nor is the higher melting chloride changed when heated in a sealed tube with phosphorus oxychloride at 130°. 5. The results are in accordance with those obtained by Remsen and his students with similar compounds, and at variance with those of List and Stein (*Ber. d. chem. Ges.*, 31 1648). 6. Evidence points to the symmetrical structure for th higher melting chloride, and to the unsymmetrical structure fo the lower melting one. *p Brom-o-sulphobenzoic Anil*, m. p 184.5°, crystallizes from alcohol in long slender needles or narro thin plates. Heated with aniline, it yields the *Symmetrica Anilide*; short silky needles (from alcohol), m. p. 236°–239° The *Unsymmetrical Anilide* does not melt at 300° and differ greatly from the symmetrical anilide in solubilities. It usuall appears as a white amorphous substance, but may also be obtaine in fine short needles by long standing of its solutions. Th *Dianil*,



$$BrC_6H_3\left\langle\begin{matrix}C{:}N.C_6H_5\\ \\ SO_2\end{matrix}\right\rangle N.C_6H_5,$$

crystallizes from glacial acetic acid in small yellow plates, m. p 199°–200°. Boiled with concentrated hydrochloric acid, it yield the anil; boiled with glacial acetic or with alcoholic potassiu hydroxide, the unsymmetrical anilide is formed. *Part II.*—Th results recorded in this second part are summarized as follows: 1 *p*-Brom-*o*-cyanbenzenesulphonic acid is not changed when boile with dilute hydrochloric acid, but boiling with slight excess c caustic alkali converts it into the alkaline salt of the *p*-brom- carbaminesulphonic acid. 2. *p*-Brombenzoic sulphinide may b hydrolyzed to *p*-brom-*o*-sulphaminebenzoic acid by boiling wit dilute hydrochloric acid or with slight excess of caustic alkali. I it is heated with phosphorus pentachloride in sealed tubes at 150 the chief product is *p*-brom-*o*-cyanbenzenesulphone chloride, whil at 200° it is *p*-brom-*o*-chlorbenzoic nitrile. 3. The alkali salts c *p*-brom-*o*-carbaminebenzenesulphonic acid, on long boiling wit dilute alkali, are hydrolyzed to *p*-brom-*o*-sulphobenzoic salts. 4 *p*-Brom-*o*-sulphaminebenzoic acid, when boiled with dilute hydrc chloric acid, yields the acid ammonium salt of *p*-brom-*o*-sulphc benzoic acid, while boiling with a slight excess of potassium hy droxide solution does not change it. *p-Brom-o-cyanbenzenesu phonic Acid*, $BrC_6H_3(CN)SO_3H$, may be obtained by the action c ammonia on the unsymmetrical chloride of *p*-brom *o*-sulphober zoic acid, or by boiling the *p*-brom-*o*-cyansulphone chloride wit water. It is very soluble in water. *Salts*. $NH_4.C_7H_3O_3NBrS$ small lustrous plates. $K.C_7H_3O_3NBrS + 1.5H_2O$; fine silk needles. $Na.C_7H_3O_3NBrS + 1.5H_2O$; long silky needles. B $(C_7H_3O_3NBrS)_2 + 6H_2O$; long lustrous rectangular plates. It wa also obtained in prisms containing $3H_2O$, and a basic salt was ol served. $Mg(C_7H_3O_3NBrS)_2 + 8.5H_2O$; diamond-shaped plate often hopper-shaped. $Zn(C_7H_3O_3NBrS)_2 + 8.5H_2O$; small plate $Cu(C_7H_3O_3NBrS)_2 + 4H_2O$; fine needles, or long, thin plates of delicate blue. *p-Brom-o-carbaminebenzenesulphonic Acid*, BrC_6

$(SO_3H)CONH_2$. Only the salts were prepared. $Na.C_7H_5O_4NBrS + 0.5H_2O$; short needles and warty clusters. $K.C_7H_5O_4NBrS$; short needles. *p-Brom-o-sulphaminebenzoic Acid*, $BrC_6H_3(COOH)SO_2NH_2$, crystallizes in long, very thin, lustrous plates, m. p. 192°–197°. It begins to lose water at 127° and passes over partly into the sulphinide. The salts of the sulphamine acid are more soluble in water than those of the sulphobenzoic acid. Heated above 150°, they pass into the corresponding salts of the sulphinide. $Na.C_7H_5O_4NBrS$; short needles. $K.C_7H_5O_4NBrS$; large rectangular plates. $Ca(C_7H_5O_4NBrS)_2 + 2H_2O$; large prisms. $Sr(C_7H_5O_4NBrS)_2+4H_2O$; long slender needles. $Ba(C_7H_5O_4NBrS)_2+2H_2O$; short needles. $Mg(C_7H_5O_4NBrS)_2+3H_2O$; short needles. Copper salt; fine needles of a delicate blue, exhibiting magnetic properties. *p-Brom-o-cyanbenzenesulphone Chloride*, $BrC_6H_3(CN)SO_2Cl$, crystallizes from ligroin in white plates, m. p. 82°. *p-Brom-o-chlorbenzoic Nitrile*, $BrC_6H_3(CN)Cl$, forms fine white needles, m. p. 51°–61°, and is volatile with steam.

M. T. BOGERT.

On the Action of Aniline upon Tetrabrom-o-Benzoquinone.

BY C. LORING JACKSON AND HORACE C. PORTER. *Am. Chem. J.*, 30, 518–537.—As noted in a previous paper (*Am. Chem. J.*, 26, 38), the *Reduction of Hexabrom-o-quinonepyrocatechin Ether*, $C_6Br_4O_2C_6Br_2O_2$, with sodium amalgam leads to the formation of a substance (m. p. 304°–307°), apparently a ***hexabrom-o-dioxypyrocatechin ether***, $C_{12}Br_6(OH)_2O_2$. It crystallizes from nitrobenzene in iridescent scales, and with benzoyl chloride forms a ***monobenzoyl derivative***, which is a white crystalline body, m. p. 316°–318°. Hexabrom-*o*-quinonepyrocatechin ether heated with hydrobromic acid in sealed tubes at 100° gives the above reduction product and what is probably tetrabrompyrocatechin. By the action of aniline upon an alcoholic solution of tetrabrom-*o*-benzoquinone, four products may be obtained—the aniline and alcohol addition-compounds of dianilinodibrom-*o*-benzoquinone, dianilinobrom-*p*-quinonanil and dianilino-*p*-quinonanil. *Dianilinodibrom-o-benzoquinone*, $C_6Br_2(C_6H_5NH)_2O_2(O_2:Br_2:(C_6H_5NH)_2::1,2:3,6:4,5)$. is best obtained by digesting its aniline addition product with a mixture of benzene and ligroin. It crystallizes from benzene in dark reddish purple needles, m. p. 160°. It readily forms addition compounds with alcohols or with aniline. The *Addition-compound of Aniline and Dianilinodibrom-o-benzoquinone*, $C_6Br_2(C_6H_5NH)_2O_2C_6H_5NH_2$, crystallizes from benzene in pale brown, long, fine needles, and melts with decomposition at 121°–124°. Alcohol readily changes it to the alcohol addition-compound. The *Addition-compound with Ethyl Alcohol*, $C_6Br_2(C_6H_5NH)_2O_2C_2H_5OH$, crystallizes from benzene in bright yellow plates, melting with decomposition at about 142°. Both these addition-products decompose slowly at temperatures as low as 60°, or when digested with a mixture of benzene and ligroin. The *Addition-compoun with Methyl Alcohol* is a yellow solid, melting with decompositio at 144°–145°. *Dianilinobrom-p-quinonanil*, $C_6HBr(C_6H_5NH$ ONC_6H_5, is the product of the further action of a mixture of an line and alcohol upon the dianilinodibrom-*o*-benzoquinone. O account of its greater stability, its lack of any tendency to for addition-compounds, and the fact that sulphur dioxide conver it into dianilino-*p*-quinonanil, it is believed to possess the pa structure. It crystallizes from a mixture of alcohol and benze in jet black plates of very brilliant luster, m. p. 173°. *Dianilin p-quinonanil*, $C_6H_2(C_6H_5NH)_2ONC_6H_5$, discovered by Zincke a Hagen in 1885, is the final product of the action of aniline up tetrabrom-*o*-benzoquinone. It melts at 202°–203°, and forms addition-compound with methyl alcohol. Its conversion to az phenine, when heated with aniline at 180°–200°, indicates its co stitution as $O:C_6H_5N:(C_6H_5NH)_2::1:4:2,5$. The monobrom d rivative noted above is believed to possess a similar structure, wi the bromine at 3 or 6. The *Reduction of Dianilinodibrom-o-benz quinone* gives rise to products which appear to be pyrocatech derivatives, but which were not identified. Hexabrom-*o*-quinon pyrocatechin ether gives the same products with aniline as tetr brom-*o*-benzoquinone. M. T. BOGERT.

On Triphenylmethylacetate. BY M. GOMBERG AND G. DAVIS. *Ber. d. chem. Ges.*, **36**, 3924–3927.—See this Journ **25**, 1269–1274. M. T. BOGERT.

On the Possibility of the Existence of a Class of Bodi Analogous to Triphenylmethyl (preliminary notice). BY GOMBERG. *Ber. d. chem. Ges.*, **36**, 3927–3930.—See this Journ **25**, 1274–1277. M. T. BOGERT.

The Preparation of Phenyl Ether. BY ALFRED N. COO *Proc. Iowa Acad. Sci.*, 1903, 113, *et seq.*—The Hoffmeister-Hirs method, in which diazotized aniline is added to phenol containi about 10 per cent. water, was found to give poor yields. T formation of a crystalline *solid*, b. p. 275°–280° (uncorr.) [pro ably azobenzene, editor], was also noted in this process. T method of Gladstone and Tribe, consisting in the dry distillati of aluminum phenolate, was found to be much the best way preparing phenyl ether, both on account of the good yield a also because of the ease and rapidity of the process. From 12 grams of aluminum phenolate over 200 grams of pure phenyl eth were obtained. M. T. BOGERT.

BIOLOGICAL CHEMISTRY.

The Influence of Certain Bacteria on the Coagulation of t Blood. BY LEO LOEB. *J. Med. Research*, 10 (New Series 5

407-420.—In mixing bouillon cultures of bacteria in certain proportions with the diluted blood plasma of a goose, the power bacteria have of coagulating fluids containing fibrinogen can be tested in vitro and approximately constant results obtained. Among the organisms tested, the *staphylococcus pyogenes aureus* was found to possess a strong coagulating power, causing frequently coagulation of the plasma in four to six hours. *Bacillus diphtheriae*, *bacillus typhosus*, *bacillus tuberculosis*, and *streptococcus pyogenes* were without any marked coagulating power. For the last two named organisms, however, this result can at present be accepted only with certain restrictions. *Bacillus pyocyaneus*, *bacillus prodigiosus*, and *bacillus coli* have not as strong a coagulating power as *staphylococcus pyogenes aureus;* their coagulating power is, however, stronger than that of the second group. The reaction of the cultures is not the cause of their coagulating power. A sterilized culture of the *staphylococcus pyogenes aureus* has lost all, or a great part, of its coagulating power. The coagulating action of bacteria is not identical with the contact action of an otherwise inert foreign body; it is probable that bacterial products contained in the liquid culture media are the direct cause of the coagulating activity of certain bacteria.

F. P. UNDERHILL.

On the Output of Ammonia in the Course of Different Forms of Insanity. BY P. A. LEVENE AND L. B. STOOKEY. *J. Med. Research*, **10** (New Series 5), 449-460.—The authors state that no general conclusions can be drawn from the results of the experiments herein contained. F. P. UNDERHILL.

The Antiseptic Qualities of Çoffee. BY W. H. CRANE AND ALFRED FRIEDLÄNDER. *Am. Med.*, September 5, 1903. Abstract *Biochem. Centrbl.*, **2**, 48.—Roasted coffee possesses a significant antiseptic action. This bactericidal action of coffee is in part to be ascribed to an aldehyde. F. P. UNDERHILL.

Gastric Secretion Induced by a Reflex from the Intestine. BY H. C. JACKSON. *Proc. Soc. Expt. Biol. and Med.*, October 21, 1903. Abstract *Biochem. Centrbl.*, **2**, 110.—The introduction of 25 per cent. alcohol into the intestine calls forth a reflex secretion of gastric juice. Section of the vagi and sympathetic nerves leading to the stomach and the employment of atropin inhibit this reflex. Nicotine, however, does not possess this property. Peppermint also calls forth a reflex secretion; other irritants, such as ether and mustard, do not. If, after section of the nerves or the application of atropin or nicotin, alcohol is introduced into the stomach, results are obtained which agree with those given above. F. P. UNDERHILL.

IV. Chemical Changes in Cheese-ripening as Affected by Different Conditions. BY LUCIUS L. VAN SLYKE AND EDWIN B.

HART. *Am. Chem. J.*, 31, 45–61.—In this article it is shown that the different conditions that affect the chemical changes in the nitrogen compounds of cheese are as follows: The formation of water-soluble nitrogen compounds increases as cheese ages, other conditions being uniform. The rate of increase is, however, not uniform, since it is much more rapid in the early, than in the succeeding, stages of ripening. The amount of soluble nitrogen compounds increases, on an average, quite closely in proportion to increase in temperature when other conditions are uniform. Other conditions being alike, there is formed a larger amount of water-soluble nitrogen compounds in cheese containing less moisture. Cheeses of large size usually form water-soluble compounds more rapidly than smaller cheeses under the same conditions, because large cheeses lose their moisture less rapidly and after the early period of ripening have a higher water-content. Cheese containing more salt forms water-soluble nitrogen compounds more slowly than cheese containing less salt. The use of increased amounts of rennet extract in cheese-making results in producing increased quantities of water-soluble compounds in a given period of time, especially such compounds as paranuclein, caseoses, and peptones. Acid appears to be essential to the formation of water-soluble nitrogen compounds in normal cheese-ripening, but the exact influence of varying quantities of acid upon the chemical changes of the ripening process has not yet been fully studied. F. P. UNDERHILL.

The Intracellular Reduction of Gold Chloride. BY A. N RICHARDS. *Proc. Soc. Expt. Biol. and Med.*, October 21, 1903 Abstract *Biochem. Centrlbl.*, 2, 107.—After the intravascular injections of gold and sodium chloride the organs of the animal rabbit, were examined microscopically. It was found that metallic gold had been deposited in the nucleus (and its near neighborhood), of the cells of the kidney, liver, spleen, stomach and intestinal mucosae, and of the heart muscle. Chemical analysis proved that by far the greatest deposit was in the kidney and liver, while in the other organs named above only traces of the metal could be shown. F. P. UNDERHILL.

The Effects of Various Salts on the Tonicity of Skeletal Muscles. BY W. D. ZOETHOUT. *Am. J. Physiol.*, 10, 211–222 —The skeletal muscle employed was the gastrocnemius muscle o the frog. The salts of potassium, caesium, ammonium and rubidium increase the tonicity of the skeletal muscles. The iodide, bromide and sulphate have a greater effect than the chloride. The chlorides of sodium and lithium, and especially those of calcium, strontium and magnesium, abolish this increase in tonicity. Certain salts of sodium, such as the iodide, bromide and sulphate, may increase the tone; but such action is generally exceedingly slight compared with their power to cause rhythmica activity. The action of the lithium salts is still less than that of the sodium salts. Barium chloride antagonizes the action of potassium chloride in preventing tonicity, and potassium chloride antagonizes the action of barium chloride in preventing rhythmical action. F. P. UNDERHILL.

The Effects of Ions on the Decomposition of Hydrogen Peroxide by Platinum Black. BY C. HUGH NEILSON AND ORVILLE H. BROWN. *Am. J. Physiol.*, 10, 225–229.—The results of a large number of experiments show that in the decomposition of hydrogen peroxide by platinum black, the cation, in general, has an inhibiting or depressing effect, and the anion has an accelerating influence. F. P. UNDERHILL.

On the Local Application of Solutions of Saline Purgatives to the Peritoneal Surfaces of the Intestine. BY JOHN BRUCE MACCALLUM. *Am. J. Physiol.*, 10, 259–269.—Solutions of many salts, including those commonly known as saline purgatives, produce increased peristalsis when applied locally to the peritoneal surface of the intestines. When administered in this way, extremely small quantities are effective: 1 cc. $m/320$ barium chloride (0.00076 gram) produces well-marked peristalsis. A somewhat greater concentration of sodium citrate, sulphate, etc., is necessary to produce the same effect. Local contractions of the intestine are produced almost immediately in the part of the loop to which these salts are applied. It is possible to inhibit these peristaltic movements by the local application of solutions of calcium or magnesium chloride to the peritoneal surface of the intestine. In order to inhibit the activity produced by sodium citrate, sulphate, etc., an approximately equal dose of calcium or magnesium chloride is required. The action of barium chloride, however, is counteracted only by a very much larger dose of calcium or magnesium. As shown by direct measurement, the quantity of fluid secreted in a unit of time into a loop of intestine isolated from the rest of the intestine by ligatures, is much greater after the subcutaneous or intravenous administration of solutions of the saline purgatives. The local administration of the solutions to the peritoneal surface of the intestine has the same effect. The secretion of fluid into the intestine can be inhibited by the administration of calcium or magnesium chloride. It is, therefore, possible to increase or inhibit the activity of the intestine, both muscular and glandular, by the administration of saline solutions. This is entirely analogous to the production and suppression of muscular twitchings in voluntary muscle described by Loeb. These experiments prove that the semifluid character of the faeces produced by the saline purgatives is due primarily, if not exclusively, to an increased secretion of fluid into the intestine. F. P. UNDERHILL.

Concerning the Formation of Sugar from Leucine. BY J. T. HALSEY. *Am. J. Physiol.*, 10, 229–236.—The experiments were carried out upon phlorhizinized dogs which were fed upon leucine, and the urines of which were analyzed for sugar and nitrogen. While the experiments allow no positive conclusions to be drawn, they indicate that leucine, when fed in a pure form to phlorhizinized dogs, is not changed into sugar. However, there still remains the possibility that the leucine complex, as it exists in proteid, may be concerned in the formation of sugar, or that when leucine is fed with the other end-products of digestion, as in the experiments of Lusk and Stiles, it, together with some other substance or substances, plays a rôle in the synthesis of sugar. F. P. UNDERHILL.

PHARMACEUTICAL CHEMISTRY.

An Improved General Method for the Assay of Alkaloidal Drugs. BY A. B. LYONS. *Pharm. Rev.*, 21, 428; and *Pharm. Era*, 30, 550.—In Keller's general method an aliquot portion of the ethereal extract from a quantity of drug is taken for the assay. This causes an error on account of the loss of the volatile solvent, especially in warm weather. Puckner has recently improved upon this method, but has unfortunately introduced an objectionable feature. The writer advises moistening the powdered drug with stronger ammonia water and a small quantity of an appropriate solvent or a mixture of such solvents, and transferring at once to a long narrow percolator provided at the lower end with a plug of cotton. In some cases it may be found desirable to pack the drug dry. Percolating at the rate of one drop per second, the drug is usually exhausted by the time 50 to 75 cc. of percolate have passed through it. W. H. BLOME.

Progress in Pharmacy. BY M. I. WILBERT. *Am. J. Pharm.*, 75, 574.—Siedler, a recent investigator, supports the claims of Lewin, Lavialle and others, that the active constituent of kava is its resin.

Kimmura finds ipecacuanhic acid to be a glucoside acid, formula $C_{17}H_{26}O_{10}$.

Strauss has found pumpkin seed to contain from 37 to 47 per cent. of a fixed oil. It has an iodine number of from 116.5 to 120.5, has a deep reddish-green color, and with such bleaching agents as sulphuric and sulphurous acids, chlorine and ozone, it reacts indifferently.

Quinaphenine is said to result from the action of quinine on the hydrochlorate of ethoxyphenylcarbamic acid, and to be useful in the treatment of whooping cough in doses of from 0.05 to 0.30 gram.

Styptol, stated to be a neutral conarnine phthalate, has been used with asserted good results as a styptic in hemorrhage of the uterus.
W. H. BLOME.

Contribution to the Chemistry of Chelidonine. BY J. O. SCHLOTTERBECK AND H. C. WATKINS. *Pharm. Arch.*, 6, 141.—In a previous paper these investigators verified the formula given this alkaloid by Henschke and Schmit and Selle, namely, $C_{20}H_{19}NO_5.H_2O$, and in addition they proved the absence of methoxyl groups. Chelidonine has a melting-point of 136° C., and rotates $[a]_D = + 115°24'$. By making acetyl and benzoyl compounds the base was found to have but one hydroxyl group. Reduction with zinc dust and glacial acetic acid gave rather indefinite results. An alcoholic solution of the alkaloid was treated with hydroxylamine hydrochloride and potassium hydroxide, and later with phenylhydrazine hydrochloride and sodium acetate, to test for the presence of aldehyde groups, but this yielded negative results, thus leading to the conclusion that the base contains no aldehyde groups. Several attempts at oxidation were made, but all resulted either negatively or in oxidizing the base completely, no intermediate oxidation product having as yet been obtained.
W. H. BLOME.

The Physiological Assay of Cannabis Indica and Its Galenical Preparations with Notes on Some Commercial Products Supposed to Represent the Active Principles of the Drug. BY L. W. FAMULENER AND A. B. LYONS. *Pharm. Arch.*, 6, 97.—After reviewing the earlier work done upon this drug to determine its active principles, the authors cite the results of the labors of T. B. Wood, Spivey and Easterfield, who isolated the following four substances: (1) a terpene, $C_{10}H_{16}$, (2) a sesquiterpene, $C_{15}H_{24}$, (3) a paraffin, $C_{29}H_{60}$, and (4) a toxic red oil, $C_{18}H_{24}O_2$. These were tested physiologically by Dr. C. R. Marshall, who found the last-named "red oil" to possess the peculiar properties of Indian hemp.

The method of testing the drug and of establishing a standard, which is done upon a dog, is given in detail. A number of commercial galenical preparations were assayed pharmacologically, the results leading to the following conclusions: That the fluid extract and extract are not subject to rapid deterioration and that they represent the activity of the drug very well. That the powdered extract is very easily oxidized and that some samples are quite inert. That preparations purporting to represent the activity of hemp in a concentrated form are in some cases entirely worthless and generally not to be depended upon. Such as are physiologically active are so costly as to make the fluid or solid extract preferable.
W. H. BLOME.

The Centenary of the Society of Pharmacy of Paris. BY M.

I. WILBERT. *Am. J. Pharm.*, 75, 570.—The centenary of th Society of Pharmacy of Paris was celebrated on October 17, 1903 This society is virtually a continuation of the Free Society c Pharmacy established in 1796, the members of which establishe and conducted the Free School of Pharmacy. This school wa replaced in 1803 by an imperial decree creating a new stat institution for instruction in pharmacy and allied branche The buildings and other property of the society were appro priated by the state for the use of its new school, thus pra tically discontinuing the society as well as its functions. Th members of the society met immediately afterward and decide that they would thenceforward devote as much of their time a possible to the study of scientific problems connected with pha macy.

As members of this society, at various periods during the pa century, we find the names of such men as Parmentier, Caventor Pelletier, Magendie, Robiquet, Vauquelin, who was the first t suggest the presence of active principles in plants, and who stated to have been the discoverer of nicotine in tobacco, an Derosne, one of the founders of the society, was one of the fir to make a chemical investigation of opium. The society is purely scientific one. It offers prizes annually for the solution c scientific problems, and it is stated that Pasteur, when a youn man, was greatly encouraged in his work by receiving one of th society's prizes. W. H. BLOME.

The Conservation and Cultivation of Medicinal Plants. B HENRY KRAEMER. *Am. J. Pharm.*, 75, 553.—Judging from th number of people engaged in the collection of our native herb and drugs, the amounts collected by them, and of the increasin scarcity of many well-known plants, it is quite safe to state tha the time is rapidly coming when many valuable medicinal plant will be nearly or quite exterminated. In order to prevent such condition, it is imperative that the plants remaining to us in con siderable numbers be husbanded, and that we become acquainte with the conditions and surroundings best adapted to their suc cessful cultivation. This requires much experimentation, tim and good judgment. It would be undesirable to produce some c the most valuable drugs because more harm than good would re sult, notably, in the case of ergot, ustilago and agaric.

It has been demonstrated by florists and lovers of plants an flowers, that many of the medicinal plants can be easily grown i the garden. Some two hundred of our cultivated ornament plants have decided medicinal virtues, and most of them are c economic importance. It is a well-known fact that quite a larg number of medicinal plants have been successfully cult vated on a very large scale, of which peppermint, the castor o plant, flax, eucalyptus and others are examples. Many valuab

European plants have become naturalized in this country from being first grown in gardens where climatic and other conditions were favorable. W. H. BLOME.

Preparing Opium in the Islands of the Pacific. BY AN EX-U. S. SOLDIER. *Pharm. Era*, **30**, 679.—Opium is quite extensively grown on many of the islands of the Pacific by the Chinese, native Indians and some Europeans, and great numbers of these people are addicted to the use of the drug. The poppy head is lanced late in the afternoon with a two or three-parallel-bladed knife. The latex oozes out during the night, covering the poppy head. This is scraped off the next morning and collected in kettles. It is next carefully sorted, kneaded on a smooth board, heated in an oven, and finally worked into various sized and shaped packages for sale. W. H. BLOME.

The Citral Assay of Volatile Oils. BY E. KREMERS AND I. W. BRANDEL. *Pharm. Rev.*, **22**, 15.—With the isolation of citral from oil of lemon, the possibility of working out a method for the chemical assay of the oil was placed in the hands of chemists. Many worked long and earnestly to accomplish this, but even to-day no accurate method is known, because of the theoretical and practical difficulties encountered. Citral being an aldehyde, the sodium bisulphite method was tried, but was not found entirely satisfactory, especially in the assay of lemon oil where the amount of citral is always small. Various modifications of the bisulphite method have been proposed from time to time. The authors recommend the following: Transfer 5 cc. of oil to a cassia flask, add to this 25 cc. of an 80 per cent. solution of sodium bisulphite, and heat the mixture in a water-bath to 60° for half an hour, shaking occasionally. Allow the flask and contents to cool, then add, shaking after each addition, sufficient distilled water to raise the lower surface of the oily layer to the zero mark on the long graduated neck of the flask. From the number of cubic centimeters of the oily stratum, the per cent. of aldehyde may be easily calculated. W. H. BLOME.

Lanolin Base for Ointments. BY H. E. NICAUD. *Pharm. Era*, **31**, 8.—It is well known that certain chemicals, when made up into ointments in which lard forms part or all of the base, are sooner or later acted upon by the free fatty acids which develop in ointments upon being kept for some time. The truth of this statement becomes very apparent upon examining an old sample of red mercuric oxide, lead subacetate, lead carbonate or of sulphur ointment. Besides the natural decomposition products of the lard, much of the lard sold as "pure" contains water, alum, cotton seed and other oils, which add to its objectionable features as an ointment base.

Wool fat, more commonly known as lanolin, does not possess these undesirable qualities. It is a neutral, bland, stable substance and may be mixed with oxides and carbonates without causing any chemical reaction. This article has been quite expensive, largely because it was imported from Europe, but local markets can now be supplied, at a greatly reduced price, with an equally good or even superior quality made in this country.

W. H. BLOME.

SANITARY CHEMISTRY.

The Preparation of Ammonia-Free Water for Water Analyses. BY J. R. WEEMS, C. E. GRAY AND E. C. MYERS. *Iowa Academy of Sciences*, **10**, 112–113.—The authors have not been able to obtain satisfactory results by the method proposed by Joseph Barnes (*J. Soc. Chem. Ind.*, 1896, 255), depending on the action of bromine on ammonia and describe a method depending on the action of sodium peroxide. Sodium peroxide is added to the water, 1.5 grams per liter of water, and the contents of the flask is boiled for one-half hour or longer, until it is estimated that the water is free from ammonia. The time of boiling, as well as the amount of sodium peroxide required, varying according to the amount of ammonia present in the water. To obtain water free, not only from ammonia, but also from nitrogen as nitrites and nitrates, the water is transferred to a copper distilling vessel and distilled, the first portion of the distillate being rejected.

LEONARD P. KINNICUTT.

The Use of Sulphate of Iron as a Coagulant at Lorain, Ohio. BY A. C. BROWN, Superintendent of Filtration. *Eng. Record*, **48**, 701–703 (1903).—Iron sulphite and lime have been used at Quincy, Ill., in the place of alum, in a mechanical water filtration plant since 1902 and the process has now been introduced at Lorain, Ohio. This plant was built in 1886, and alum was used as a coagulant till 1890, when, on account of cost, the iron sulphite solution process was introduced (description of process, this Journal, **24**, R 425). This process, according to the writer, though costing only $2.22 per million gallons in place of $6.25 when alum was used, and giving results practically as good from the bacterial point of view as the alum process, was accompanied by so rapid and serious a corrosive action of the acid iron sulphite solution that a continuation of the process seemed scarcely possible. On September 11, 1903, the plant, after thorough repair, was put in operation using ferrous sulphate and lime. Analyses were made three or four times daily and the results with the amounts of chemicals used, from September 11th to October 2nd, are given. The amount of lime varied from 0.25 grain to 0.98 grain, and the ferrous sulphate from 0.80 to 2.16 grains per gallon. The bacterial results are as a rule good, though in certain few cases the percentage reduction of bacteria did not exceed 80 per cent. and in five cases out of the 103 analyses, the filtered water contained over 100 bacteria per cubic centimeter. The lake water contained, only on one occasion, over 5000 bacteria per cubic centimeter, and as a rule contained less than 1000. LEONARD P. KINNICUTT.

Bacteria in Soil in Relation to Infiltration Galleries for Water Supply. *City Record*, New York, 1903; *Eng. Record*, 48, 501–502.—In the investigation as regards the safety of an increased water supply for Brooklyn, N. Y., that is to be obtained by infiltration galleries from the sand and gravel strata underlying the water-sheds east of that borough, Mr. Whipple has made tests to determine the number of bacteria at various depths. The infiltration galleries consist of vitrified clay pipes of various diameters, buried in trenches from 10 to over 20 feet deep, laid with open joints and surrounded with gravel and broken stone. The tests described were made along the lines of the proposed galleries and indicated that below a depth of 5 feet the sand never contains more than a very small number of bacteria, and that tests for *B. coli* give negative results. One of the tests was made at a place where loads of manure are often piled; the surface soil contained 360,000 bacteria per gram; there were none at a depth of 15 feet, and samples taken at depths of 5, 9 and 10 feet contained, respectively, 2,040, 450 and 120 bacteria per gram of soil, and gave negative results for *B. coli*. A series of eight tests near the Valley Stream station of Long Island Railroad at different depths gave the following results:

BACTERIA IN SOIL FROM TEST WELL AT VALLEY STREAM.

Depth in feet.	Apr. 24.	Apr. 25.	Apr. 27.	Apr. 28.	Apr. 29.	May 4.	May 5.
0	136,130	353,700	200,000	173,700	164,400	156,300	142,400
0.5	115,790	175,600	182,000	81,580	77,500	19,700	40,600
1	6,800	111,700	17,400	28,700	5,750	4,900	3,300
2	2,850	35,870	5,800	8,950	1,150	2,200	2,000
3	885	6,780	3,160	3,040	1,600	100	880
4	380	1,900	2,240	2,100	260	50	520
5	60	730	160	210	160	0	0
6	0	830	110	160	broken	0	0
7	0	170	...	...	...	...	...

To quote from Mr. Whipple, "These results indicate that below a depth of 5 feet the sand never contains more than a very small number of bacteria. Tests for *B. coli* were negative. These studies appear to corroborate the more extensive investigations which have been recently made in England, which show that water which is collected from beneath the surface of the ground at depths greater than 6 feet, and under such conditions that no water is collected which has not passed through a depth of soil equal to about 6 feet, may be considered as safe from the sanitary standpoint. The destructive influence of the upper layers of soil upon the pathogenic bacteria has been found by recent experiments to be very marked, and it is now considered that the chief danger and practically the only danger to a well water is from contamination from the surface of the ground where the water enters the well without passing through the upper strata of the soil. Comparisons of the chemical analysis with the bacteriological tests have shown in many cases that waters, which from the chemical standpoint were apparently unsatisfactory, were entirely free from sewage bacteria. These statements are of course true only when the soil is of such a character as to act as an effective filtering medium. They may not be true in regions where there is a clay soil where the cracks allow contaminated water from the surface to pass to the wells."

LEONARD P. KINNICUTT.

The West Allis Plant of the Allis Chalmers Company. *Eng. Record*, **48**, 241 (1903).—At the conclusion of an article giving a general description of the works of this company is an account of the process used by the company for treating the sanitary sewage from the works, accompanied by a plan and section of the plant, which, on account of its many excellent features, deserves attention. The sewage is first passed through a septic tank, next through an upward anaërobic filter for the continuance of the hydrolysis of the solid substances, then an aërobic filter of loosely piled material, upon which the sewage is discharged in thin sheets. The septic tank is built essentially on lines which have been used during the past six years, the only novel feature being the controlling device, which, by means of a simple floating weir, maintains a constant flow from the tank notwithstanding the irregular use of water in the shops.

LEONARD P. KINNICUTT.

The Septic Tank for the Treatment of Sewage at the Soldiers' Home Near Santa Monica, Cal. BY JAMES D. SCHUYLER. *Municipal Engineer*, **26**, 1–6.—A full description of the septic tank, with plans and photographs, and specifications under which the construction was done. The tank is 80 feet long, 20 feet wide, 10 feet deep, divided lengthwise into two compartments; walls and floors of concrete, with a roof of asphalt and gravel. The total cost was $2,535.00. The average amount of sewage treated is about 125,000 gallons daily. The effluent from the tank is run upon an irrigation field which is used for the growing of vegetables. When the tank was first put in operation, and during the last days of March, the odor arising from the raw sewage in the tank was very offensive. This gradually decreased, and within a month or two became scarcely noticeable. Since then the operation of the tank has given entire satisfaction, and no complaints have been made. It has been cleaned out but once, about a year after it was put into use, and but a few inches of sandy or ashy sediment were found at the bottom of the tank.

LEONARD P. KINNICUTT.

The Mechanical Filter Plant for the Danville Water Company. *Eng. Record*, 48, 802–804 (1903).—Danville, a city of about 24,000 population, in central eastern Illinois, obtains its water from the Vermillion River, and has just completed a new rapid sand filtration plant. The plant, built under the supervision of the New York Continental Jewell Filtration Company, of New York, consists of a settling basin, 6,000,000 gallons capacity, two concrete coagulation basins, 20 feet deep, 35 feet inside diameter, allowing two hours' sedimentation, and eight filters, only four of which have as yet been equipped. The sand used has an effective size of 0.54 mm. and a uniformity coefficient of 1.3. The filters have a capacity of 750,000 gallons per day each when filtering at the rate of 125,000,000 gallons per day. In place of aluminum sulphate, ferrous sulphate furnished by the American Steel and Wire Co., is used as the coagulant. This fact, and the two following guarantees given by the Jewell Filtration Co., are the most interesting points regarding this plant. "It is hereby agreed by the contractor, that the cost of coagulant necessary to be used in the system proposed, in order to accomplish the degree of purification specified, shall not exceed $1.65 per million gallons filtered, when water is at its highest degree of turbidity, and shall not exceed an average of $1.10 per million gallons filtered, when the water is at its average state of turbidity, at the present market prices of materials. The water to be filtered, is the water of the north fork of the Vermillion River from above the dam of the Danville Water Company, and the purification obtained shall be such that in no case shall the average number of bacteria in the filtrate exceed 100 per cubic centimeter, except when the number of bacteria in the applied water shall exceed 3,300 per cubic centimeter, in which event the average reduction of bacteria in the filtrate shall be at least 97 per cent. Not more than 5 per cent. of the individual samples of the filtrate shall show more than 150 bacteria per cubic centimeter, or with the unfiltered water containing 3,300 or more bacteria per cubic centimeter, not more than 5 per cent. of the samples of the filtrate shall show an efficiency as low as 90 per cent. No trace of undecomposed coagulant shall be left in the filtrate, nor shall the filtrate show any increase in iron or alumina, or an alkalinity greater than the unfiltered water. The filtrate shall show no acid reaction. The filtered water shall be clear, bright and practically free from color and turbidity or matter in suspension."

LEONARD P. KINNICUTT.

The Chemical Composition of Sewage of the Iowa State College Sewage Plant. BY J. B. WEEMS, J. C. BROWN AND

E. C. MYERS. *Iowa Academy of Sciences*, 9, 70–81.—A description of the plant was given in "Proceedings of Iowa Engineering Society for 1900," and the present paper gives only chemical data showing the working of the plant. Analyses of the raw sewage septic tank effluent and sand bed effluent were made weekly from January 10, 1899, to October 1, 1901, and the results obtained are given in tables. The sewage is a concentrated sewage containing about 100 parts of chlorine per million, and the analyses show that the effluent from the beds, except in a very few cases, meets the requirements of the Mersey and Irwell Standard, *i. e.*, that a sewage effluent should not give more than 1.43 parts of albuminoid ammonia or absorb more than 14.3 parts of oxygen per million parts. As a result of this investigation, the authors believe that the satisfactory purification of sewage by bacterial methods is possible under climatic conditions prevalent in the state of Iowa. LEONARD P. KINNICUTT.

The Sioux City Water Supply. BY ALFRED N. COOK AND C. F. EBERLY. *Iowa Academy of Sciences*, 9, 90.—The city water supply is obtained from 104 driven wells ninety feet deep, the source being beneath an impervious stratum of clay. The water is stored in a reservoir 150 feet in diameter. Sanitary and mineral analyses of this water are given, showing that it is a fair potable water. A comparison of the sanitary analyses with those made ten years ago show that while the nitrogenous organic matter in the water, as shown by the free and albuminoid ammonia has remained about the same, the amount of chlorides have increased two and one-half, and the nitrogen as nitrates fifteen-fold and the volatile solids are three times as great as in 1891. Analyses are also given of the waters of the Great Sioux River, from which most of the ice used in the city is taken, of the Missour River, of the Floyd River, and of various wells in the city.

LEONARD P. KINNICUTT.

The Typhoid Fever Epidemic at Butler, Pa. BY GEORGE A. SOPER. *Eng. News*, 50, 574–577.—This article is the result of a careful personal investigation made by Dr. George A. Soper of the typhoid fever epidemic which caused the illness of about one person in every thirteen of the inhabitants of Butler. It gives an account of the outbreak of the epidemic, the work of the State Board of Health, the sanitary condition of the water supply, the operation of the water works system just before the epidemic, and a comparison of this epidemic with other epidemics. The water company at Butler had three sources of water supply. Two sources were at different points on the Connoquenessing Creek and the third on the chief tributary of the creek, known as Thorn Run, but at the time of the epidemic all of the water was obtained from one source, a point on the creek itself just outside the town limits where the pumping station is situated. This was due to the fact that the dam, on the creek about seven miles above the town, the location of the second source of supply, was being rebuilt, and that the third source of supply, an impounded reservoir on Thorn Run, though completed, was unavailable on account of lack of rain. The sanitary condition of the water-sheds of these three sources of supply is fully described, and then summarized as follows:

"To summarize what has been said concerning the sanitary condition of the drainage areas which furnished unfiltered water to the borough of Butler between October 20th and 31st: There were many sources of pollution, and possibly several of infection; typhoid fever in the country was by no means unknown and probably occurred to a greater extent than can now be determined. At least six cases of typhoid fever were present between July 17th and the date of the epidemic. Four cases have existed on the main tributary since July; two cases were present on a brook within a mile of the intake of the water supply. Another brook whose surroundings show that it must have contained excrement and possibly typhoid germs enters the Connoquenessing within 100 feet of the intake of the water supply at the pumping and filter station." In connection with the water supply there is a rapid mechanical filtration plant, erected at the pumping station consisting of six open gravelly filters, 15 feet in diameter and 8 feet deep, built of steel and containing 6 inches of gravel and $4^1/_2$ feet of round grain gravelly sand.

On October 21st, the filter plant was shut down for repairs and not again used till October 31st. Between these two dates the inhabitants of Butler were supplied with unfiltered water taken directly from the creek at the pumping station. Within ten days from the time the filters were put out of commission the epidemic was in progress. In the next fortnight the large amount of sickness was the chief subject of discussion. On November 29th a mass meeting of citizens was called and on December 11th the reports from appointed canvassers showed 1188 cases, fairly evenly distributed throughout the city. The official figures of the State Board of Health were to December 17th, 1,270 cases and 56 deaths. In comparing this epidemic with three severe epidemics of typhoid fever that have taken place during the past twenty-five years, Dr. Soper gives the following data:

			Number		
Place.	**Date.**	**Population.**	**Cases.**	**Deaths.**	**Cause.**
Caterham, Eng....	1879	5,800	352	21	Water supply.
Plymouth, Pa	1885	8,000	1,104	114	
Ithaca, N. Y	1903	13,000	1,300	78	
Butler, Pa..........	1903	18,000	1,270[1]	56[1]	

Though stating it is still to early too take full measure of the Butler epidemic.

LEONARD P. KINNICUTT.

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[1] To December 17th.

INDUSTRIAL CHEMISTRY.

Rockwell Rotary Melting Furnace. *Iron Trade Review*, January 21, 1904.—This furnace is a very radical departure. It may utilize the heat from spent gases of combustion, for the melting of metals, etc., which is accomplished by means of two egg-shaped chambers, arranged end to end and communicating through the small ends. The contents of one chamber is in process of melting, while the other is in the process of pouring, and so the operation is practically continuous with one heat supply.

S. P. SADTLER.

A Combined Coal and Water Gas Plant. *Am. Gas Light J.*, January 18, 1904. — Blue water gas is mixed with coal gas at a high temperature, which renders the mixture permanent and incondensable. The hydrocarbons, which would form tar if the gases were mixed cold, are taken up by the freshly produced water gas.

Three methods for accomplishing this purpose are described. The crude retort gas is mixed with the freshly made water gas and then the combined gases passed through superheating chambers. The means for heating the retorts and superheaters vary, and the producers are at one time used to make producer gas to heat retorts and chambers, and at other times in the cycle to generate water gas.

S. P. SADTLER.

The Economic Admission of Steam to Water Gas Producers of the Lowe Type. BY G. W. MCKEE. *J. Soc. Chem. Ind.*, December 31, 1903.—In ordinary practice in the operation of water gas producers, steam is admitted according to conditions of the producer, such as: 1. Temperature in the generator, judged by the length of the preceding "blow"; 2. Depth of the fuel bed; 3. The question as to whether an "up" or "down" run is being made; 4. The length of time that has expired since clinkering. According to the reaction used in the formation of water gas, $C + H_2O = CO + H_2$, the author points out that in operating the process the steam should at corrected temperature and pressure be about one-half the volume of the gas produced. And if any undecomposed steam goes through the apparatus the efficiency is impaired because of the 1. cost of the steam; 2. the loss of heat due to its passage through the machine; [illegible] necessity of condensing the steam. 4. Furthermore the steam acts as [illegible] of the carbon monoxide, above the coke, in the generator [illegible] setting. The author conducted experiments on three water gas machines in which the lengths of the runs were [illegible] minutes. First of all, by the use of a test cock the author was able to get gas from which steam could be condensed. By measuring by the use of a gas holder, the amount of gas formed at stages during the run could be determined, from which curves were drawn. This was found to rise to a maximum in the first minute, due to the cooling of the gas on entering the condenser, and also in wet runs due to the time necessary to admit the oil. The curve is shown to fall off between the third and fifth minute, which is about the time the oil is cut off in the making of gas of 18 to 25 c. p. The author, therefore, proposes to cut down the steam to one-half directly after cutting off the oil supply. In this way it was found that a good deal of coke was saved and the percentage of carbon dioxide in the gas was cut down, and during the first of the run the machine could be run up to its maximum efficiency. S. P. SADTLER.

The Morse Heat Gauge. Report of the Committee on Science and Arts on the invention of Everett Morse. *J. Frank. Inst.*, January, 1904, p. 33.—The older methods of determining high temperatures are described. Especially those of Siemens and Le Chatelier and the invention of Mr. Morse was found to be "simple, practical and founded on good scientific principles." The principle of the apparatus is described in one of his patents, *viz.*: The method of gauging the temperature of a material, which becomes incandescent when heated, consists in comparing said material, heated to the luminous state, with an optical standard so that at least a portion of one is in the path of the rays passing from the other to the eye, observing the standard and material, and noting when the one merges in the other to such a degree as to indicate the correct temperature within the necessary limits.

Mr. Morse's standard is a simple incandescent lamp, the temperature of its filament, and therefore its color, can be regulated by varying a resistance in circuit with a milliammeter. The lamp is enclosed in a tube open at both ends through which the observer looks. The rays from the object will thus be superposed by the rays from the glowing lamp. When the intensity of both colors is the same, the spiral of the lamp will not be seen. A table based on observations of a LeChatelier pyrometer converts the ampere readings into temperatures. S. P. SADTLER.

The Pitting Rust of Iron. BY DR. W. H. BIRCHMAN. *Am. Gas Light J.*, November 16, 1903.—This occurrence has only been noticed recently and is not yet understood. The author cites some instances and gives some results of his observation. The pits occur on iron that is protected by paint as well as on that exposed and progress with the time exposed. These pits seem to occur, when the iron is buried in soil containing ammonia, and the pipes through which ammonia and hydrogen sulphide pass, especially the two in combination. Rust-proof paints do not protect the metal but the author found that paraffin was effective. Even iron, tin-plated and also previously plated with copper, did not prevent the pitting. S. P. SADTLER.

The Agaves. Industrial applications by E. W. Wilson. *Sci. Am. Suppl.*, December 12, 1903. The agaves have a long leaf like that of the well-known century plant. They contain long fibers of value for textile purposes for making ropes and bagging, also for clothing when carefully prepared. The plants grow best in limestone soil. Yucatan, Mexico, annually exports $12,000,000 worth of the fiber to the United States and is called Lisal hemp in this country. They have not yet been acclimated to any part of the United States, but the possible bringing it here is of interest when it is considered that in Mexico it is used for food, drink, soap, clothing, cordage needles, thread, paper, medicaments, etc.

S. P. SADTLER.

Catechu. BY W. E. RIDENOUR. *J. Frank. Inst.*, December, 1903, p. 417.—Catechu is chiefly known in the American market as "Cutch," and no longer comes in mats, bags or boxes, but in dark brown lumps. It is obtained from the wood and pods of the *acacia catechu* and from the betelnut of India. It contains tannin and catechin. The United States Pharmacopeia, 1890, gives the following tests: If a portion of catechu be digested with ten times its weight of alcohol and the liquid filtered, the undissolved matter after being dried at 100° C. should not exceed 15 per cent. of the original weight. The tincture diluted with 100 parts of water acquires a green color on the addition of ferric chloride solution; the ash should not exceed 6 per cent. The following valuable analytical tables are given in full:

	Samples marked	Ash.	Starch.	Blood.	Color with ferric Chloride.	Tannin.	Dextrin.
	A. & D., before being Pr	3.5	..	..	Brown Green No Ppt.	40.0	Heavy
	A & D., new lot..................	6.8	..	..	Brown Green Ppt.	49.6	..
	A. & D., Bell brand.............	3.5	..	..	Brown Green and Ppt.	67.6	..
No. 1.	Liverpool, Woodward	3.9	..	..	Green and Ppt.	36.0	..
No. 2.	Liverpool, Woodward	6.1	..	..	Brown and Ppt.	58.8	..
	Philadelphia	0.4	..	..	Brown and Ppt.	72.8	..
	A. & D. high grade.............	4.2	..	..	Green Ppt.	62.8	..
	8418, Scharunpoor, India	4.3	..	..	Green.	41.6	..
	8417, Scharunpoor, India	3.9	..	..	Green.	44.0	Trace
	9910, No. West Prov., India.....	10.1	..	..	Green.	35.6	..
F.	3615, Pondicherry, India	58.5	Heavy	..	..	0.8	..
	8569, Scharunpoor, India	1.2	..	..	Brown Green	34.8	Heavy
	McK. & R., Catechu.......	2.7	..	..	Brown Green	34.4	..
	McK. & R., Terra Japonica.....	4.6	..	..	Green	25.6	..
	S. D. & E. Co. —— A....	1.5	..	..	Brown Green	28.4	Heavy
	S. D. & E. Co. —— B....	11.7	.	..	Brown Green	22.8	Heavy
	P. C. P. Acacia Catechu.........	1.8	..	..	Brown Green	30.8	Heavy
	Immedial cutch —— G..	60.1	..	..	..	..	..
	Immedial cutch —— O..	60.3	..	..	..	..	..
J. R.	Straits Settlement, port of shipment, Singapore—Woodward, Liverpool.	6.5	..	Slight odor	Brown	2.4	..

Samples marked.	Hot ethyl alcohol.	Ether.	Acetone.	Paralde-hyde.	Fusel oil.	Purified methyl alcohol.	Water.
A. & D., before being Pr	60.1	10.6	54.9	14.2	57.5	64.7	79.6
A. D., new lot	31.7	0.4	2.5	1.6	6.0	55.9	82.0
A. & D. Bell brand	83.5	0.7	38.4	6.0	16.2	86.4	87.6
No. 1. Liverpool, Woodward	39.0	1.3	5.1	2.5	13.2	47.6	72.8
No. 2. Liverpool, Woodward	50.6	0.3	17.2	0.6	11.3	81.5	89.2
Philadelphia	87.2	6.0	83.5	2.1	82.6	86.2	88.8
A. & D , high grade	70.1	2.0	62.5	1.1	21.9	79.6	82.8
8418, Scharunpoor, India	80.6	21.2	81.0	13.8	88.5	77.4	75.6
8417. Scharunpoor, India	75.2	36.4	71.4	24.2	83.8	70.0	82.8
9919. No. West Prov. India	62.4	23.6	59.6	32.0	64.4	69.2	70.4
F. 3615, Pondicherry, India	9.8	3.8	5.6	4.8	11.8	12.8	14.4
8569, Scharunpoor. India	62.0	12.2	53.2	12.2	62.0	68.4	88.8
McK. & R., Catechu	57.2	0.6	7.0	2.0	16.8	60.2	74.0
McK. & R., Terra Japonica	66.4	27.2	56.0	7.4	64.8	72.6	76.0
S. D. & E. Co. — A.	62.6	31.0	58.4	19.0	75.8	65.4	86.0
S. D. & E. Co. — B.	40.0	13.0	32.0	8.6	53.0	41.4	72.4
P. C. P. Acacia Catechu	61.6	18.2	50.6	11.8	62.4	64.2	83.6
Immedial cutch — G.	..	..	..	..	..	..	..
Immedial cutch — O.	..	..	..	..	..	..	..
J. R. Straits Settlement, port of shipment, Singapore — Woodward, Liverpool	53.2	0.8	14.4	0.4	19.4	81.0	92.0

If cutch is to be used for tanning or medicinal purposes, then the ash, ethyl or methyl alcohol-soluble portion and tannin should be estimated. For dyeing purposes, a practical dye test only is of value. The dyeing properties seem to reside in the tannin. Pure catechu tannin (for method of purification see original article) is of a reddish brown color and completely soluble in water, alcohol and acetone and insoluble in ether, except when it contains water and alcohol. A 1 per cent. solution of this pure tannin in water gives with:

Ferric chloride	Dirty green.
Ferrous sulphate	No change.
Lead acetate	Whitish.
Potassium bichromate	Red-brown.
Ferric acetate	Olive-green.

S. P. SADTLER.

Increasing the Fastness of Basic Dyes to Light. *Textile Colorist*, p. 261, September, 1903.—An auxiliary compound, discovered by Grabroski, made by combining zinc, glucose and alkali to form a soluble compound, is used to fix basic colors so as to render them more fast to light. The compound is prepared by mixing 150 grams of glucose syrup with 20 grams of chloride of zinc solution of 63° Bé. with constant agitation and to this 28 grams of caustic soda solution of 35° Bé. are added. Favorable results have been obtained with goods dyed with brilliant green, malachite green, magenta, rhodamine, turquoise blue, methyl violet, Victoria blue, benzopurpurine, thiazol yellow, geranine, diamine blue, chrome violet, etc. S. P. SADTLER.

Different Gases in Gas Engines. *Am. Gas Light J.*, November 16, 1903. BY PROF. ALBERT H. WHITE, of the University of Michigan.—The large gas engines which are now being built are rarely designed for illuminating gas, being built for fuel gas and very recently for blast-furnace gas. If all the blast-furnaces in the United States were equipped with gas engine plants, using only the gas which is now being wasted, there would be 1,500,000 H. P. generated over and above their own power requirements. Because of the poorness of blast-furnace gas, it was first thought to be unfit for power purposes, but of the heat units it contains, a larger proportion of energy can be utilized in this way than with illuminating gas. The basic theory of the gas engine is the rapid compression of the mixed air and gas, the energy going largely into heat. With illuminating gas the limit of this is due to danger of premature explosion and this is much greater than with blast-furnace gas, which only carries about 33 per cent. of combustible gases. A comparison of gases is given as follows:

	Carburetted water gas.	Blue water gas.	Blast-furnace gas.
Net heating value, B. T. U. per cubic foot	673.	278.	111.
Volume of air required for 1 cubic foot of gas	5.90	2.21	0.792
Volume of products of combustion from 1 cubic foot of gas	6.68	2.75	1.627
Volume of charge in cubic foot { Gas	0.145	0.311	0.558
Volume of charge in cubic foot { Air	0.855	0.689	0.442
Temperature of explosion at constant pressure degrees C	2,190	2,145	1,690
Absolute temperature	2,460	2,418	1,963
Initial pressure products of combustion in atmospheres	0.965	0.855	0.908
Pressure of explosions in atmospheres	8.02	7.13	6.15
Relative volume of gas in charge, carburetted water gas = 1	1.	2.01	3.85

The results show a higher efficiency for the engine using blast-furnace gas, in greater work done per unit of heating value for lower temperature and pressure of explosion. Extensive tables are also given as follows:

1 and 2.—Table of mean specific heat at constant volume (for carbon dioxide, water vapor and nitrogen and oxygen).

Expressed I.—Calories per liter.
Expressed II.—Calories per gram.

3.—Table of mean specific heats at constant pressure.

Expressed III.—Calories per liter.
Expressed IV.—Calories per gram.

4.—Relative values of certain gases and their products of combustion in the theoretical amount of air. S. P. SADTLER.

Notes on the Operating of Large Carburetted Water Gas Jets. BY W. CULLEN MORRIS. *Am. Gas Light J.*, November 2, 1903.—After comparing the results of Dr. J. Kramers, Drs. Stracke and Jahoda, in which he shows some disagreements in results, he gives results obtained in a works, operating carburetted, water-gas generators. He compares with the greatest exactness the methods of producing gas by 11 and 12 foot sets and finds those with 12 foot grates the more efficient—the most comprehensive table is here given in detail as there are many valuable figures for reference contained therein. G is the only 12 foot generator.

	Case No.	A.	B.	C.	D.	E.	F.	G.
	Velocity of steam, lbs. per min.	67	77	87	97	102	107	72
	Steam cock opening, degrees	75	75	75	75	75	75	67½
	Steam pressure, lbs	50	60	70	80	85	90	70
	Length of blow, min	6.5	6.5	7	7	7	7.5	7
	Length of run, min	8	8	8	8	8	8	8
	Minutes up	3	4	4	4	4	4	4
	Minutes down	5	4	4	4	4	4	4
	Blast-pressure, inches	18	18	18	18	18	18	20
Per 1000 cu. ft.	Generator coal, lbs	33.12	36.14	33.28	33.19	32.73	34.22	33.3
	Generator cinders, lbs	1.06	1.83	0.82	0.93	0.75	0.77	0.0
	Steam, lbs	14.84	24.19	24.87	26.65	27.94	30.31	24.03
Per sq. ft. grate	Generator coal, lbs	49.88	50.41	50.98	53.77	51.81	52.81	53.42
	Generator fuel, lbs	51.48	52.97	52.24	55.28	53.00	54.01	53.42
	Steam, pounds	29.88	33.75	38.50	43.17	44.73	46.65	38.63
	Make, cubic feet	1,506	1,395	1,532	1,620	1,583	1,577	1,608
	Time between	12	12	12	12	12	12	12
	Aver. time spent on cleans, min	72	104	75	69	62	62	69
	Carbonic acid, per cent	2.8	3	2.9	3.1	3.2	3.1	3.1
	Length of test, days	7	7	5	10	10	3	5
	Final condition of fires	bad	bad	bad	good	good	fair	good

S. P. SADTLER.

Notes on the New Jersey Fire-Brick Industry. BY H. RIES. *Iron Age*, October 22, 1903 (read before the American Institute of Mining Engineers).—The fusion point of the New Jersey fire-clays ranges from Seger cone 27 to cone 33. Most of the clays are quite silicious, few containing less than 70 per cent. SiO_2; the alumina contents are not high, nor the per cent. of ferric oxide large. The tensile strength is low, ranging from 40 to 50 pounds per square inch. The fire-shrinkage, when burned to Seger cone 8, may range from 6 to 8 per cent. depending on the sandiness.

J. W. RICHARDS.

AGRICULTURAL CHEMISTRY.

Field Operations of the Bureau of Soils, 1902 (Fourth Report). BY MILTON WHITNEY *et al.* *U. S. Dept. Agr.*, 1903, pp. 842.—During the calendar year 1902, 17,996 square miles were surveyed and mapped by the 15 soil survey parties engaged in this work. The total area surveyed up to the end of 1902 was 33,867 square miles and included districts in 36 states and territories. This volume contains a general review of the work during the year by the chief of the bureau and 32 reports by the soil survey parties dealing with the location and boundaries, history

of settlement and agricultural development, climate, physiography and geology, types of soil, agricultural methods in use, and the agricultural conditions of areas located in 26 states and territories including Porto Rico. Numerous mechanical analyses of soils are given in the different reports. The volume is illustrated by 60 plates and 25 text figures and is accompanied by 44 soil maps.
H. W. LAWSON.

The Present Status of Soil Investigation. BY C. G. HOPKINS. *Ill. Agr. Expt. Sta. Circ. No.* **72,** 21 pp.—This address was delivered before the meeting of the Association of American Agricultural Colleges and Experiment Stations at Washington, D. C., November 17, 1903, and is to a large extent an adverse criticism of Bulletin 22 of the Bureau of soils on "The Chemistry of the Soil as Related to Crop Production," the review of the literature in that bulletin being characterized as cursory, the methods of analysis used being believed to be absolutely untrustworthy (as stated in an added note), and the conclusions drawn being considered unwarranted by the data presented. Results of investigations in Illinois and elsewhere are cited to show a relation existing between crop production and the plant food in the soil as determined by chemical methods. For instance, it is stated that "the principal types of soil in central and northern Illinois contain from two to three times as much plant food, and produce two to three times as much corn, as the principal types in southern Illinois. These are not mere theories; they are absolute facts, based upon chemical analysis of the soil, upon pot cultures carried on under controlled conditions, upon actual field experiments, and upon regular crop yields in ordinary farm practice."
H. W. LAWSON.

The Chemistry of Soils as Related to Crop Production. B E. W. HILGARD. *Science,* **18,** pp. 755–760.—This, like the above, is a critical review of Bulletin 22 of the Bureau of Soils, and was also read at the same meeting. Judged by the test o agricultural practice, the water extract method employed is declared by the testimony furnished by the bulletin itself to be failure. "It seems to the writer that the verdict upon the mai theses put forward so confidently in this paper must be an emphatic 'not proven!'" H. W. LAWSON.

The Maintenance of Fertility. BY C. E. THORNE. *Ohi Agr. Expt. Sta. Bull. No.* **141,** pp. 67–84.—This bulletin, whic contains the results of field experiments with fertilizers begun i 1893, discusses questions relating to the economical production o crops by the use of commercial fertilizers. It is not believed tha a definite ratio between the phosphorus, nitrogen, and potassiu in fertilizers can be fixed for all soils and crops. Under th conditions of the experiments phosphorus was the controlling ele ment in the production of cereal crops. Potassium was the least effective. All three elements, however, were essential to the highest effectiveness of the fertilizers. H. W. LAWSON.

Reclamation of Alkali Land at Fresno, California. BY T. H. MEANS AND W. H. HEILEMAN. *U. S. Dept. Agr.*, *Bureau of Soils Circ. No.* 11, pp. 9.—This is a brief report upon experiments conducted by the Bureau of Soils for the purpose of affording a practical demonstration of the value of drainage and flooding in the reclamation of alkali lands. Analyses of the drainage water are reported. H. W. LAWSON.

Colorado Irrigation Waters and Their Changes. BY W. P. HEADDEN. *Colo. Agr. Expt. Sta. Bulls. Nos.* 82, 77 pp.; 83, 16 pp.—Numerous analyses of the water of the Cache la Poudre River and other streams, and of ground, drainage, and seepage waters are reported in Bulletin 82 and discussed in detail. The conclusions drawn are not capable of being briefly summarized. In Bulletin 83, the author discusses in a general way some of the changes caused by irrigation. H. W. LAWSON.

The Underground Waters of Arizona: Their Character and Uses. BY W. W. SKINNER. *Ariz. Agr. Expt. Sta. Bull. No.* 46, pp. 271–296.—The author discusses the suitability of Arizona waters for drinking, irrigation, and technical purposes, and reports analyses of 235 miscellaneous samples.

H. W. LAWSON.

Irrigation Investigations in 1901. BY J. A. WIDTSOE *et al.* *Utah Agr. Expt. Sta. Bull. No.* 80, pp. 65–199.—In the work reported, analyses were made of the irrigation water used and of the soil upon which the experiments were made; the downward and lateral movement of the water applied was followed by means of moisture determinations, and the effect of irrigation upon the yield and composition of a number of crops was studied. The very interesting chemical features of this work have already been presented in an article in this Journal (25, 1234).

H. W. LAWSON.

Influence of Climate and Soil on the Composition and Milling Qualities of Winter Wheat. BY A. M. SOULE AND P. O. VANATTER. *Tenn. Agr. Expt. Sta. Bull.*, *Vol. XVI*, *No.* 4, pp. 51-88.—This work, which has been in progress at the station for 4 years, has included among other objects, a comparison of 48 varieties of wheat as regards adaptability to Tennessee conditions and value for flour and bread-making, and a study of the standardization of varieties and their subsequent improvement by crossing and seed selection. The average protein content of the 48 varieties for four years ranged from 17.39 per cent. in the case of Mediterranean to 13.19 per cent. in the case of Dawson's

Golden Chaff. A seasonal variation in the protein content was observed. This is illustrated by the protein content of Fulcaster, which was 18.45 per cent. in 1900, 15.6 per cent. in 1901, 18.27 per cent. in 1902, and 15.92 per cent. in 1903, and also by the protein content of Beech Wood's Hybrid, which was 21.92 per cent. in 1900, 13.77 per cent. in 1901, 15.74 per cent. in 1902, and 15 per cent. in 1903. A high-protein content was associated with a deficient rainfall during the ripening period. Neither the fertilizers used nor the soil treatment affected materially the protein content. The percentages of ash and gluten in the flour of the different varieties as well as other data are reported.

H. W. LAWSON.

The Influence of Environment upon the Composition of the Sugar-Beet, 1902, Including a Study of Irrigated Sections. BY H. W. WILEY. *U. S. Dept. Agr., Bureau of Chem., Bull. No.* **78,** pp. 50.—Meteorological, field, and analytical data are given for experiments with sugar-beets carried on by the Bureau of Chemistry in collaboration with the Weather Bureau and the experiment stations in California, Colorado, Indiana, Kentucky, Michigan, New Mexico, New York, Utah, Virginia, and Wisconsin. This is the third report upon this subject. The coöperation of the California, Colorado and Utah stations extended the work to irrigated sections. The average content of sugar of beets grown in the irrigated areas was 2.4 per cent. higher than that of the beets grown in the non-irrigated areas, which difference is attributed, in part at least, to the more equable temperature in the former case.

The results as a whole confirm those obtained in previous years. Unobstructed sunshine is not believed to be absolutely necessary to the normal development of the sugar content of the beet. The sugar content and the coëfficient of purity increased in a general way as the average length of day increased and as the temperature decreased. A high altitude showed a marked tendency to counteract the influence of a low latitude. In the presence of sufficient moisture to meet the ordinary demands of the crop the influence of rainfall was unimportant.

The relation of phosphoric acid, nitrogen, and potash in the soil to the yield of sugar-beets is discussed. The largest yield reported was associated with high percentages of phosphoric acid and potash, but with a low percentage of nitrogen in the soil. The lowest yield was obtained on soil abundantly supplied with phosphoric acid and nitrogen, but showing a deficiency of potash. The next to the lowest yield was associated with a deficiency of both phosphoric acid and nitrogen. "It is evident, however, that the data correlating the quantity of available plant food in a soil and the magnitude of the crop produced have their full value only when the meteorological conditions and all other elements of the environment are the same."

The yield of beets and the percentages of sand, clay, and silt in the soil and subsoil are shown in a chart. "This chart, in so far as we know, is the first attempt to graphically illustrate the relation of the mechanical composition of the soil to the crop. The problem is so new and the data so fragmentary that we can not claim that much progress has been made in the attempt to elucidate any of the undeveloped principles, if there be such principles, which correlate the mechanical composition of the soil and the yield of the crop." The sugar-beet is not believed to be well adapted to a study of this kind. H. W. LAWSON.

A Further Study of the Influence of Lime upon Plant Growth. BY H. J. WHEELER AND G. E. ADAMS. *R. I. Agr. Expt. Sta. Bull., No.* **96**, pp. 23-44.—On an acid soil fertilized with potassium chloride, dissolved bone-black, magnesium sulphate, and either ammonium sulphate or sodium nitrate, liming was beneficial in the case of asparagus, rhubarb, squashes, pumpkins, peas, currants, red raspberries, pansies, poppies, and zinnias, and a decided disadvantage in the case of lima beans, black raspberries, and cranberries. Sodium nitrate was more effective than ammonium sulphate in most instances. H. W. LAWSON.

Experiments upon the Use of Potash as a Fertilizer. BY H. J. PATTERSON. *Md. Agr. Expt. Sta. Bull. No.* **89**, pp. 165–196. —In addition to a report upon experiments, begun in 1897, this bulletin contains a brief historical sketch of the use of potash in agriculture, a discussion of a number of questions such as the rôle of potash in plants and the origin of potash in soils, and a description of the forms of potash fertilizers. In the work at the station the time and method of application, the relation of potash fertilizers to other forms of plant food, and the effect of potash on the quality of the crops were studied. Various potash fertilizers were compared on corn, potatoes, cowpeas, wheat and hay. The results in general favored the application of fertilizers containing large quantities of chlorides several months before planting the crop, and those containing potash as sulphate at the time of planting. The one exception to this was cowpeas, which gave results directly the reverse. While none of the potash fertilizers increased the yield to any marked extent, the results on the whole pointed toward the chloride as being the most efficient, with the sulphate ranking second. The use of lime did not materially increase the effectiveness of either the chloride or sulphate. In these experiments no special effect of the potash fertilizers upon the quality of the product was observed. In experiments previously reported by the station, potash had a beneficial effect upon the quality of tobacco and tomatoes. H. W. LAWSON.

Cooperative Experiments in Top-dressing Grass Land. BY H. J. WHEELER. *R. I. Agr. Expt. Sta. Bull. No.* 95, 19 pp. —In 11 coöperative experiments in different localities in Rhode Island the application of 350 pounds of nitrate of soda, 300 pounds of muriate of potash, and 600 pounds of acid phosphate per acre resulted in an average net gain of $3.90 per acre or 20.9 per cent. profit on the money invested for the fertilizers.

H. W. LAWSON.

Studies on the Vegetable Proteins. BY T. B. OSBORNE AND I. F. HARRIS. *Conn.* (*State*) *Agr. Expt. Sta. Rep.*, 1902, Pt. IV., pp. 448–467.—This consists of abstracts of papers which have been published in full in this Journal or which it is stated are soon to be published. The titles as given in this article are as follows: The state of combination of nitrogen in protein bodies; the globulin of the English walnut, the American black walnut, and the butternut; the precipitation limits of some vegetable proteins with ammonium sulphate; the specific rotation of some vegetable proteins; the carbohydrate group in the protein molecule; and the tryptophane reaction of various proteins.

H. W. LAWSON.

Metabolism of Matter and Energy in the Human Body, 1900-1902. BY W. O. ATWATER, F. G. BENEDICT, *et al.* *U. S. Dept. Agr., Office of Expt. Stas., Bull. No.* 136, pp. 357.—Twenty-one metabolism experiments made with the Atwater-Rosa respiration calorimeter are reported in full, and the results are summarized with those of 34 experiments of the same kind previously reported. All of these experiments were made with the same form of calorimeter. The apparatus has since undergone important modifications, which are described. The investigations yield valuable data regarding the conservation and transformation of matter and energy in the body, the nutriment required by the body under various conditions, and the nutritive value of different foods. Numerous deductions are made concerning these and other questions which it is impossible to present satisfactorily in abstract form.

H. W. LAWSON.

Investigations among Fruitarians in California, 1901-1902. BY M. E. JAFFA. *U. S. Dept. Agr., Office of Expt. Stas., Bull. No.* 132, pp. 81.—In the 9 dietary studies and 31 digestion experiments carried on at the California Agricultural Experiment Station in continuation of earlier work, fruits and nuts constituted in the majority of cases all or almost all of the diet. It is believed that enough work has been done along this line to show that fruits and nuts are quite thoroughly digested and have a much higher nutritive value than is popularly supposed, and that they can therefore be compared favorably with other and more common foods. It is also considered that as sources of carbohy-

drates, fruits at ordinary prices are not expensive; and as sources of protein and fat, nuts at usual prices are reasonable. The wholesomeness of a long-continued diet of fruits and nuts has not been studied.
H. W. LAWSON.

Butter and Butter Substitutes. BY P. SCHWEITZER. Columbia, Mo., 1903, 28 pp.—The 31 samples examined included butter, butterine, oleo oil, lard, cotton-seed oil, beef stearin, lard stearin, lard oil, peanut oil, sunflower oil, and olive oil, all the samples being of known origin. Determinations were made of the Hübl, Reichert-Meissl, Köttstorfer, and Hehner numbers, the index of refraction, and the heat of combustion. The results are discussed at some length. The author's conclusion is as follows: "As this study was undertaken chiefly to answer the question whether certain fats used as food by man could be distinguished, one from the other, I would say that butter, oleo, neutral, cotton-seed oil, beef stearin, lard oil, and any of their mixtures, whether called butterine or any other name, can be distinguished one from the other with perfect certainty and that in mixtures, even those containing a certain proportion of butter, the nature of the components can be ascertained with a reasonable degree of accuracy."
H. W. LAWSON.

Olive Oil and its Substitutes. BY L. M. TOLMAN AND L. S. MUNSON. *U. S. Dept. Agr., Bureau of Chemistry, Bull. No.* 77, 64 pp.—This contains a detailed report of investigations of pure olive oils and of oils sometimes substituted for olive oil, of which a summarized account by the authors, was given in this Journal (**25**, 954), and in addition, the results of an examination of 157 samples of commercial olive oils, of which 72 were labeled French oils, 67 Italian, and 15 California. Of the 61 samples of imported oils obtained from customs officers, only 5 samples contained oils other than olive, and of the 78 samples purchased in market 16 were adulterated. Of the 15 California oils purchased in market 2 contained cotton-seed oil. The adulteration of foreign olive oils imported into this country is therefore believed to be practiced to a much less extent than is popularly supposed. The much more extensive adulteration of the samples bearing labels indicating foreign origin and purchased in market is therefore apparently practiced in this country.
H. W. LAWSON.

Readings on the Zeiss Butyro-Refractometer of Edible Oils and Fats. BY H. C. LYTHGOE. *Tech. Quart.*, **16**, pp. 222–226. —Actual readings obtained by the author for cocoanut oil, beef stearin, cocoa butter, beef tallow, mutton tallow, lard stearin, beef oleo, lard oil, peanut oil, rape seed oil, yellow mustard oil, black mustard oil, sunflower oil, corn oil, and poppy seed oil are reported. Calculated readings for these oils and fats at different temperatures are tabulated, the table also incorporating the butter readings by Zeiss, the lard readings by Hefelman, and the olive oil and the cotton-seed oil readings by Leach.

H. W. Lawson.

The Relative Digestibility of Some Edible Fats and Oils. By J. F. Moore. *Ark. Agr. Expt. Sta. Bull. No.* 78, pp. 33–41. —The digestibility of several vegetable and animal oils and fats was determined in experiments with mice and guinea pigs. Cooked oils were more digestible than raw oils and soft fats more digestible than hard fats. While the digestibility of a fat was found to decrease as the melting-point increased, the ratio was not constant, an increase in the melting-point apparently having less influence as this temperature approached or exceeded that of the body. The author concludes that the vegetable oils are not inferior to the animal fats as heat producers and are equal or superior in digestibility.

H. W. Lawson.

Food Products and Their Adulteration. By E. F. Ladd, *et al.* *N. Dak. Agr. Expt. Sta. Bull. No.* 57, pp. 249–315.— Some of the results of food inspection during the year are reported and the use of preservatives in foods is discussed at some length.

H. W. Lawson.

Commercial Fertilizers. *Conn.* (*State*) *Agr. Expt. Sta. Rep.*, 1903, Part I; *Fla. Dept. Agr. Mo. Bulls. Nos.* 83, 85; (*Ind.*) *Purdue Univ. Spec. Bull.*, *Mar.*, 1903; *Ky. Agr. Expt. Sta. Bulls. Nos.* 104, 109; *La. Agr. Expt. Sta. Bull. No.* 73; *Me. Agr. Expt. Sta. Bulls. Nos.* 90, 94; *Md. Agr. College Quart.*, *Nos.* 19, 21; *Mass. Agr. Expt. Sta. Bulls. Nos.* 89, 90, 92, *Rep.*, 1902, pp. 9–21; *Mich. Agr. Expt. Sta. Bull. No.* 210; *Mo. Agr. Expt. Sta. Circ. Inf. No.* 16; *N. H. Agr. Expt. Sta. Bull. No.* 97; *N. J. Agr. Expt. Sta. Bulls. Nos.* 163, 168; *N. Y.* (*State*) *Agr. Expt. Sta. Bull. No.* 230; *N. C. State Bd. Agr. Bull.* 24, *Nos.* 2, 3; *Pa. State Dept. Agr. Bulls. Nos.* 101, 109, 114; *R. I. Agr. Expt. Sta. Bulls. Nos.* 89, 93, 97; *S. C. Agr. Expt. Sta. Bulls. Nos.* 73, 80, 82; *Tex. Agr. Expt. Sta. Bull. No.* 67; *Vt. Agr. Expt. Sta. Bulls. Nos.* 98, 99, *Rep.*, 1902, pp. 268–271; *W. Va. Agr. Expt. Sta. Bull. No.* 85; *Wis. Agr. Expt. Sta. Bulls. Nos.* 99, 100, *Rep.*, 1902, pp. 247–250.—The above publications were distributed during the calendar year 1903. They include analyses of over 10,000 samples of commercial fertilizers and other data obtained in fertilizer inspection in the States mentioned. The majority of the publications relate to the work done in 1902. Some few of the bulletins, such as New York State Bulletin 230 and Vermont Bulletin 99, discuss rather fully the value and use of fertilizers.

H. W. Lawson.

PATENTS.

AUGUST 4, 1903.

735,059. Augustus O. Bourne, Providence, R. I. **Vulcanizing rubber.** A gaseous vulcanizing substance as air is forced into the vulcanizing chamber containing the articles at a suitable temperature and pressure.

735,071. Guillaume D. Delprat, Broken Hill, New South Wales, Australia. Extracting **zinc, lead and silver** sulphides. The finely ground ore is fed into a bath of nitric acid containing sodium nitrate to raise its specific gravity, and gas bubbles form on the surface of the ore particles that float the ore to the surface where it can be run off.

735,084. Albert M. Fuller, St. Paul, Minn. **Paste.** Ten parts of borax are added to 100 parts of cooked flour and water, the whole dried and ground.

735,098. Carl Hoepfner, Frankfort-on-Main, Germany. Obtaining **lead.** Ores or mattes containing silver, lead, iron and zinc are leached with a solution of cupric chloride containing sodium chloride, the silver is removed by copper and mercury, the iron by copper oxychloride, the lead by zinc sulphite as a sulphite, the copper is precipitated from the resulting chloride solution by zinc, and the zinc chloride solution decomposed to recover zinc and the chlorine used to leach fresh ore.

735,142. George Palmer, Brooklyn, N. Y. Assignor to Wm. R. Hearst, New York, N. Y. Making **half-tone printing surfaces.** A thin film with half-tone screen on one side is placed film side up on a sensitized gelatine surface, a negative is placed on top of the screen and printed, the unaffected gelatine is dissolved off, and the exposed portions of the plate etched to make a printing surface in relief. The screen may be a color screen, when a plurality of plates will be made for color-printing, and may be separated from the sensitized surface.

735,148. Alexander S. Ramage, Cleveland, Ohio. **Food from whey.** The whey is made alkaline, concentrated to three-tenths its volume, alcohol added to precipitate whey proteids, and the desired amount of lactose, and the precipitate dried.

735,149. As above, but only sufficient alcohol is added to precipitate proteids, not lactose.

735,155. Gustav O. Rosenleaf, Muscatine, Iowa. **Fire-proof compound.** Sand and cement, 25 parts each, and 50 parts sawdust wet with solution of blue vitriol.

735,244. Hans Goldschmidt, Essen-on-Ruhr, Germany. Assignor to Clarence B. Schultz, Berlin, Prussia. **Metal-welding.** A crucible is filled with a mixture of iron oxide and aluminum, ignited, and the melted product poured around the joint to be welded.

735,272. William Kent, Passaic, N. J. Process of **making gas.** A charge of coal is made incandescent, another charge added and air blown in at the top and bottom, while steam is admitted in the zone of greatest heat, and the gas withdrawn midway of the charge.

735,278. Adolf Luft, Lemberg, Austria-Hungary. **Plastic insulating compounds.** Phenol is mixed with formalin (equal parts) and 40 per cent. sulphuric acid of 16° Beaumé, the mixture boiled to obtain a precipitated mass, to which camphor and alkali are added and the whole boiled and dissolved in glycerin and formaldehyde, the product thickened by boiling and the mass molded and dried.

735,293. Eugen Polte, Magdeburg-Sudenburg, Germany. **Solid articles of wolfram and lead.** A mixture of the pulverized metals is made and molded under pressure.

735,361. Henry L. Gantt and Frederick W. Taylor, South Bethlehem, Pa. Assignors to Morse Thermo Gage Co., Trumansburg, N. Y. **Finding and regulating temperature.** A light ray is passed through a standardizing medium as colored glass which gives it a determinate intensity and color with which the brightness and color of a heated article is compared. The latter may be the closed end of a tube immersed in a metal bath whose temperature is to be determined.

735,365. Robert A. Hadfield, Sheffield, England. Making **steel.** Iron from which carbon, manganese, and silicon are removed is put in a vessel with weighed portions of chromium, nickel, and aluminum all melted to make chromium nickel steel.

735,424. Frederick W. Taylor and Henry L. Gantt, South Bethlehem, Pa. **Pyrometer process.** A standard incandescent lamp is compared with the hot substance whose temperature is desired.

735,425. **As above** for the apparatus. The incandescent lamp and the heated substance are viewed through the same tube. See 735,361.

735,436. Richard A. Anthony, New York, N. Y. **Photographic film.** A sensitive layer is applied to one side of a nitrocellulose support, a protective layer of colored insoluble wax or paraffin is attached to the back of the support, light-excluding means as insoluble colored gelatin on the back of the film, and numerals or marks on the back of the colored layer.

735,444. James H. Baker, Saratoga Springs, N. Y. Assignor to Baker and Shevlin Co., same place. Treating **sulphite paper stock.** The stock is mixed with water, and regulated jets are allowed to play on the mixture so as to separate the long and short fibers, the former of which are pressed into sheets.

735,460. William L. Burnam, Kansas City, Mo. **Refractom-**

eter. Two sliding concentric telescope tubes are provided with suitable lenses, revolving dial, jointed standard, graduated bands and pointers, and an adjustable chin rest.

735,464. Eugene A. Byrnes, Washington, D. C. **Electrolytic diaphragm.** An electrolytic cell with an electrode of fusible metal, means for melting it, and a diaphragm of particles of ferroso-ferric oxide floating on said electrode.

735,501. Charles A. Harp and John F. Starkweather, Sr. Stockton, Cal. Assignors to George Marks, Sacramento, Cal., and Ben Davis, W. A. Morris, and John F. Starkweather, Jr., Sacramento, Cal. Extracting **gold and silver.** Kaolin 400, brick dust 300, limestone, sawdust, and charcoal (5 pounds each), are added to the pulverized ore, the mixture is roasted till the sulphur is gone, then potassium nitrate is added, if an oxidizing action is desired.

735,512. Henry Hirsching, San Francisco, Cal. Extracting **gold, silver,** etc. Chloridized ores or tailings containing gold, copper, silver, nickel and zinc are washed, leached with ammonia or a soluble ammonium salt, the gold and silver precipitated by electrolysis, the base metals as oxides by caustic soda, and boiling, then separating the sodium zincate by water as zinc hydroxide, separating the nickel oxide by ammonia and boiling whereby nickel hydroxide is precipitated and ammonia recovered.

735,528. James E. Kirkpatrick, Taunton, England. **Refractory bricks.** Crude pure magnesite from southern India is first dead-burnt, then ground and oxidized by exposure to the air, with a little borax, enough water is added to just bind it and it is molded and burned at high heat.

735,536. Adolf Lehmann and Edmund Schonhals, Moscow, Russia. **Photographic plate.** A transfer plate of flexible metal, a sensitive layer and a thin sheet of rubber interposed.

735,538. Julis Lewey, Biebrich, Germany. **Artificial wax.** A compound of acetone 5, paraffin 85, ceresin 5, and stearin 5 parts.

735,542. Henry T. Lyttleton, Marshall, Texas. **Spirometer.** Two vessels are made of the shape of an acute triangle of about 40°, the acute end being slightly truncated, and one side of each vessel open. One is inverted in the other, and the inner one hinged at the acute end, with an external index arm and inlet pipe for the air. The acute end of the outer vessel has also a foot.

735,594. Alfred G. Salamon, London, and Percy Williams, Rochester, England. Assignors to the British Granite Co., London, England. **Refractory material.** Artificial stone is treated with sodium silicate and sodium bicarbonate both in solution; it is then soaked in a 15 per cent. solution of calcium chloride and heated to about 80° C., washed, dried, and stoved. See patents 631,719, 668,562, 682,540, 686,672, 689,120, for "uralite."

735,599. Hermann Schrader, Hunningen, Germany. **Mordanting wool.** The wool is treated with a mixture of soluble chromium salts and the organic acids of vinasse, $COOH.CH_2N(CH_3)_3OH$.

735,604. John F. Smith, Chicago, Ill. **Paint.** Turpentine 3, beeswax 3, gelatin 1 and boiling water 3 parts make No. 1, gum copal 1, linseed oil 6, turpentine 2 and wood alcohol 1, No. 2, and paraffin 3, raw linseed 3, and ammonia 1, No. 3. Color is added and the three compounds mixed and molded into pastille crayons.

735,666. Robert A. Hadfield, Sheffield, England. **Chromium nickel steel.** Contains between 0.6 and 1.75 carbon, between 0.25 and 5 of chromium, and between 0.25 and 7 of nickel, all per cents. May also have 0.2 of manganese and the same of aluminum and 2.5 of silicon.

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735,748. William A. Givens, Pittsburg, Pa. **Compound for steel-making.** Soak bath for cast-steel ingots of salt and borax each 44 and charcoal 12 parts by weight.

735,775. Paul Julius and Friedrich Rubold, Ludwigshafen-on-Rhine, Germany. Assignors to Badische Anilin Co. **Sulphur dye.** Dinitro-*m*-dichlor benzene is treated successively with alkali thiocyanates and an aromatic amino hydroxy compound and the product melted with sulphur and sodium sulphide, which gives a black powder soluble in sodium sulphide solution, insoluble in cold acetone, benzene, glacial acetic acid and ethyl alcohol, dyeing unmordanted cotton from alkaline bath shades that turn blue on exposure to air.

735,777. Satori Kato, Chicago, Ill. Assignor to Kate Coffee Co., same place. **Coffee concentrates.** The beans are roasted, powdered and pressed to remove fat, the volatile oil distilled off, the fiber separated and the remainder dried and granulated; a portion of this is pulverized and mixed with the volatile oil, dried at a low temperature and the remainder of the granulated material added.

735,808. William Peto, and James W. T. Cadett, Ashlead, England. **Battery electrolytes.** Powdered lead sulphate moistened with dilute sulphuric acid.

735,819. Alonzo Ramsdell, Chicago, Ill. **Alloy.** Lead 12, antimony 6, and aluminum 8 ounces are melted and mixed with 100 pounds of cast iron.

735,820. Charles J. Reed, Philadelphia, Pa. Assignor to Security Investment Co., same place. **Secondary battery plates.** Lead in a moist condition is treated with hydrochloric acid gas, and an oxidizing agent to form lead chloride, and the chloride reduced to spongy metallic lead by zinc chloride.

735,894. Wm. B. Middleton, London, England. Treating **zinc ores.** The ore is first heated, then transferred on a layer of incandescent fuel and reduced, then fresh fuel added and another layer of heated ore, etc.

735,902. Carl V. Petraeus, Iola, Kansas. Treating **zinc ores.** The ore is mixed with carbon and smelted without air, the volatilized zinc collected, and the residue heated in an oxidizing atmosphere to oxidize the zinc and lead and drive them off as fumes that are screened and the metals thereby recovered and whitened by heating to a red heat.

735,903. Oliver H. Picher, Joplin, Mo. **Spelter from zinc ore.** The ore is heated till the lead sublimes but not the zinc; the residue is desulphurized and calcined, then mixed with carbon and heated in retorts to volatilize the zinc.

735,919. Alphonso A. Tregidgo, San Francisco, Cal. **Quicksilver furnace.** Shaped like a blast-furnace with a hopper on top and a cone in the bosh with point up, hollow, perforated, and movable vertically to open or close the shaft of the furnace, a vapor pipe near the top, a burner opening into the bosh, and an inclined hearth at the bottom of the furnace.

735,941. Arthur W. Burwell, Cleveland Ohio. Assignor to Elmer A. Sperry, same place. **Flux** for use in tinning. Palmitic, stearic, free oleic acids, and a hydrocarbon whose boiling-point is higher than the melting-point of tin.

735,948. Charles Combes, Paris, France. **Carbon tetrachloride.** Carbon is heated with sulphur chloride in an atmosphere of chlorine, the products are condensed and the sulphur chloride continuously returned to the system.

736,007. Fritz Perrelet and Carl Becker, Offenbach-on-Main, Germany. **Decomposing fats.** A current of fat and steam is introduced into a close chamber under pressure, and simultaneously but at a different place a current of alkali and steam is introduced and the two intimately mixed and carried through a heated conduit into a separating tank.

736,008–9–10. Carl V. Petraeus, Iola, Kansas. **Zinc ores.** The ore may be first roasted to desulphurize it, then mixed with carbon and highly heated to volatilize most of the zinc, which is condensed, then heating the residues with carbon to recover the volatile metallic portion, mixing the zinc oxide with water and fine carbon to a paste and smelting it.

736,016. James H. Reid, East Orange, N. J. **Generating electricity.** Gaseous fuel is diffused through the pores of an electric conductor, maintained in surface contact with an oxygen-bearing fluid of lower electrical conductivity than said conductor, maintaining the oxygen-bearing fluid at a higher temperature than the incoming gas, and providing an external circuit from said conductor through said fluid.

736,017. As above for the **battery.** A sealed vessel with hollow electrodes of porous tubes has a circulating pipe connecting the top and bottom with interposed receptacle, and means for heating the electrolyte of an alkaline hydroxide.

736,061. Marc W. Beylik, Burbank, Cal. Assignor to John M. Sherman, Freemont, Ohio. **Cetyl-guaiacol.** Guaiacol is added to sodium alcoholate; this solution is poured on fused spermaceti, thoroughly mixed and digested for three hours at 83° C.; then glycerol is mixed with the mass and the cetyl-guaiacol separated by collecting on the surface, being insoluble in glycerol.

736.078. Henry T. Durant, London, England. Apparatus for **dissolving ores.** A tank with conical bottom and a pipe connecting the top and bottom for circulating the solvents by an interposed pump.

736,083. Herbert C. B. Forester, Sketty, England. **Artificial fuel.** Exposes the mixture to a regulated low heat, and afterwards adds a certain amount of moisture.

736,087. John G. Graham, Bramhall, Stockport, England. Contact apparatus for **sulphuric acid.** The contact pieces are trough-shaped in cross-section, disposed transversely across the chamber, with corrugated sides turned towards the inflowing gases.

736,098. Lallah S. Highton, San Francisco, Cal. Administratrix. **Purifying alcohol.** A small per cent. of a fixed polybasic acid as phosphoric is added to the raw spirit whereby alkyl acids are made which are neutralized, and the mixture is finally distilled, the acids remaining in the retort.

736,162. Scott A. Smith, Providence, R. I. **Lubricant.** To each barrel of oil is added 1 gill of an aqueous solution of tartaric acid mixed first with 1 gallon of the oil. One pound of antimony trioxide is mixed dry with ¼ pound of tartaric acid and half a gill of boiling water added, mixed, and 1 pound air-slaked lime added, and the whole stirred into the barrel of oil.

736,204. Max Buchner, Mannheim, Germany. Assignor to C. F. Boehringer Sohne, Mannheim-Waldorf, Baden, Germany. **Reducing nitro and azo compounds.** The compounds are mixed with tin and hydrochloric acid to form stannous chloride, then put in the cathode space of a cell and high-tension currents passed, precipitating the tin for reuse.

736,205-6. As above, for the **reduction of aromatic nitro compounds.** The first for putting the substance in an electrolytic cell with a chromium compound. The second for mixing the substance with an alkaline cathode bath and passing an electric current in the presence of a copper anode.

736,250. Friedrich Hanssen, Altoona-on-Elbe, Germany. **Hemoglobin** preparations. Solutions of hemoglobin are mixed with carbonates, and an acid added to free the carbon dioxide. May be added to milk.

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736,374. Friedrich Fischer and Hugo Guntrum, Elberfeld, Germany. Assignors to Elberfeld Co., New York, N. Y. **Developing photographs.** The developing solution contains amino-*o*-hydroxybenzyl sulphonic acid, a sulphite and an alkaline carbonate.

736,380. Richard Gley, Berlin, Germany. Assignor to Actien Gesellschaft for Anilin Fabrikation, Berlin, Germany. **Blue sulphur dye.** Hydroxydiphenylamine is heated with sulphur to 180° C. and above. The dye is insoluble in water, soluble in caustic alkali and warm sulphuric acid blue, in alkali sulphide green-blue, and dyeing fast indigo blue.

736,381. Moritz F. R. Glogner, Freiburg, Germany. **Purifying graphite.** The powdered graphite is first washed with cold water whereby quartz, iron, etc., are removed, then stirred into a paste with three or four times its weight of water and half its weight of petroleum, in a closed vessel, allowed to stand, and then water sprinkled over the top of the liquid whereby the graphite is separated from earthy substances.

736,400. Noah V. Hybinette, Bayonne, N. J. Assignor to International Nickel Co., N. J. **Nickel-iron alloys.** Ores consisting mainly of iron, nickel and copper sulphides are roasted with common salt, then heated to decompose the iron and nickel chlorides while the copper chloride is leached out and the residue made directly into nickel steel.

736,401. Georges Jaquemin, Malzeville, France. **Yeast.** Low yeast is cultivated in a nutritive medium, and for a part of that nutritive medium an equal quantity of a must and an organic acid are substituted progressively in successive cultures.

736,402. As above, for acclimating a **yeast** in a sugared liquid of density 1104 by centesimal densimeter, and an acidity equal to 5 grams tartaric acid and 2 grams sulphuric acid per liter, made by successive cultures as in 736,401.

736,403. Oscar Kaltwasser and Max Gaumer, Berlin, Germany. Assignors to Aktien Gesellschaft für Anilin Fabrikation, same place. **Indigo-blue sulphur dye.** A specified indophenol is heated in a boiling aqueous solution of 1 molecule of crystallized sodium sulphide to 4 atoms of sulphur; the dye is insoluble in water, but soluble in caustic alkalies dull green-blue, in warm concentrated sulphuric acid violet, dyeing unmordanted cotton dull green-blue becoming a fast indigo-blue by oxidation.

736,411. John L. Leonard, Pasadena, Cal. Assignor two-thirds to John M. Armstrong Longbeach, and Ertell W. Lincoln of Pasadena, Cal. **Locating minerals.** Two electrodes are placed at different points in the earth to be prospected and the earth around them saturated with two liquids having unequal action on the electrodes which are connected by a measuring device insulated from the earth, and the resistance measured.

736,444. Jules E. C. L. Putzeys, Brussels, Belgium. **Purifying water.** An aqueous solution of carbonic anhydride is added to filtered water, and the whole passed through masses of calcium carbonate and then aërated to precipitate the lime salts.

736,479. Friedrich Berg, Warrensville, Ohio. **Deodorizing petroleum.** Crude oil is treated with alkali for several hours at above 212° F. in a closed chamber having an outlet at the top for air and gases, but condensing in the top the condensable vapors while passing air through the body of oil and alkali.

736,480. **As above for apparatus** to carry out the process comprising a treating tank, providing with air blasts in the bottom and two double coil condensers above the treating tank.

736,529. Roberto Lepetit, Susa, Italy. **Formaldehyde compound.** An astringent and antiseptic compound of reddish brown color, insoluble in water, soluble in weak alkali with bright magenta color, and in alcohol, acetone or glycerol reddish brown, obtained by the reaction of formaldehyde on hematoxylone.

736,565. Ignaz Szirmay, Buda-Pesth, Austria-Hungary. **Zincing by electrolysis.** The object is made the cathode with a zinc anode in an electrolyte of zinc sulphate, dextrose, and a mixture of aluminum and magnesium sulphates containing at least 15 per cent. magnesium, passing the current and adding zinc sulphate as required.

736,611. Carl G. P. DeLaval, Stockholm, Sweden. **Extracting zinc.** An electric furnace is made with a pocket under the electrodes and the powdered zinc ore piled in a sloping heap at the opposite end of the furnace so that the radiant heat of the arc plays on its surface, the non-volatile ingredients run into the pocket and the volatile metal is conveyed away and condensed.

736,625. Francis I. DuPont, Wilmington, Del. Apparatus for **condensing and mixing acids.** Especially for condensing nitric acid fumes in sulphuric acid. A plurality of tanks arranged on a slope with connections from bottom to bottom, and from the bottom of the upper vessel to the bottom of the lowest one in the series. The upper or gas spaces of the vessels are also connected.

736,698–9. Both to Alonzo P. Cuthriell, Portsmouth, Va

Assignor to Dolphin Paint Co., same place. **Anti-fouling composition.** The first, shellac varnish, raw linseed oil, arsenious acid, and oxides of iron and mercury, the second adds zinc oxide, turpentine and tar.

736,712. Ricardo Fortun and Eduardo Semprun, Madrid, Spain. **Aluminum solder.** Copper 6, silver 1, tin 60, aluminum 29.5, bismuth 3, antimony 0.5 parts.

736,730. Gerhard Hoyermann, Hanover, Germany. **Rendering phosphoric acid soluble in citric acid.** One hundred parts of finely ground natural phosphate are treated with 30 parts of sulphuric acid 50° Beaumé and 30 parts of water.

736,812. Rudolph Bormann, Berlin, Germany. **Solder.** A paste of powdered tin, zinc chloride and cellulose that can be applied by a brush.

736,838. Harry W. Gander, Rudy, Pa. **Wood preservative.** Linseed oil 112, varnish 6, turpentine 6, alcohol 4, charcoal 12, and alum in powder 3 parts.

736,868. Wm. M. F. McCarty, Rockyridge, Md. Assignor to Arthur Coppel, N. Y. **Electrolysis of water.** Sodium and potassium tartrates, 1 pound each, are added to a ton of water, sulphuric acid $^1/_{500}$ part added, the current passed and the gases collected.

736,869. James J. McTighe, Pittsburg, Pa., by Anna and Mary Adelaide McTighe, his executrices. **Lime and gas.** An ordinary lime-kiln is operated under a vacuum and the gas passed through the hot carbon.

736,876. Emile Raynaud, Spy, and Leon Pierron, Jette St. Pierre, Belgium. **Sulphuric anhydride.** The vessels containing the contact substances have at each end masses of feeble catalytic action, those of great power being in the middle, whereby dissociation is prevented.

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736,924. Bror A. Bergman, Nyfors, Sweden. **Recovering tin.** Tin scrap is made the negative pole in a solution of caustic alkali, and a metal positive to tin used as the positive pole, whereby the tin is caused to dissolve as alkaline stannate, and is recovered.

736,946. Eugene R. Edson, Cleveland, Ohio. Assignor to Edson Reduction Machinery Co., Augusta, Me. Deposing of **foul gases.** The vessel producing foul gases is connected with a tank by means of a pipe perforated to the top; in the bottom of said tank is a perforated water supply to dissolve all gases soluble in water; others pass out at the top to another vessel, the first having also a connection with a sewer drain.

736,957. Georges Gautier, Paris, France. **Artificial leather.**

Raw hide is softened by lime, then disintegrated and mixed with chrome oxide and zinc sulphate and pressed into sheets.

736,959. Gustav Glock, Berlin, Germany. Pure **acetic acid.** An acid alkaline sulphate is added to crude pyroligneous acid and the mixture distilled.

736,982. Arthur B. Larcher, Oldtown, Me. Assignor to Penobscot Chemical Fiber Co., same place. **Electrolysis of salines.** An anode, a diaphragm, and a cathode, consisting of a series of vertical gratings that support the diaphragm and have an impervious bottom.

736,994. Ben Z. Meth, Brzozdowce, Austria-Hungary. **Etching glass.** A pattern is etched in a metal plate and filled with a pasty printing and etching medium, consisting of ammonium fluoride 2, hydrofluoric acid 1, magnesium carbonate 70, white dextrin 30, yellow dextrin 20, aniline black 5 and water 30 parts, transferring the pattern by tissue paper to the object and allowing it to etch and then washing it off by water.

737,003. Robert McKnight, Philadelphia, Pa. **Condensing volatile fumes.** A rotatable bowl has a fixed cover with fume pipe and water supply delivering near the bottom of the bowl, which is provided with partitions adapted to mix the water and fumes.

737,015. Wm. H. Paxton, Birmingham, Ala. **Furniture polish.** Machine oil 40, oil of cloves, oil of cinnamon and gutta percha dissolved in machine oil (3 each), and brown vinegar 30. The oil and vinegar are first mixed at 130° F., and the rest added.

737,023. Frederick C. Rockwell, West Hartford, Conn. **Artificial fuel.** Hard, porous carbonized peat is impregnated with a metallic sulphate and sodium chloride.

737,024. Louis Roehm and Paul Walther, Chicago, Ill. **Artificial stone.** One part of magnesia and 3 parts of sand are mixed dry and wet with a composition of magnesium bromide 2, and sodium salt and potassium sulphate (1 each), and aluminum chloride about 1 part and sufficient water, the whole molded to shape.

737,046. James B. and Warren L. Truitt, and Wm. G. Temple, Cripple Creek, Colo. Assignors one-fourth to Beauregard Ross, Denver, Colo. **Precipitating zinc box.** Two tanks with conical bottoms, pipes connecting the bottoms and each tank with a perforated inner box to hold the zinc and a supply pipe to one tank with funnel top, the tanks being arranged on a slope.

737,055-6. Wm. J. Armbruster, St. Louis, Mo. **Making pigments.** Solutions of zinc sulphate, and an alkaline carbonate are mixed with barium sulphide, then with more zinc sulphate the several precipitates being collected and mixed. The second patent uses zinc nitrate and sodium sulphate and carbonate.

737,060-1. Aron M. Bean, Denver, Colo. The first for **zinc and copper.** The ores are mixed with an oxidizing flux and heated in a closed chamber with just sufficient air to form sulphates, the heat being indirect, then leaching and precipitating. The second patent is for **precious metals,** by treating their pulverized ores in the same way, combustion of the sulphur being carefully avoided.

737,067. Winfield S. Brandt, Binghampton, N. Y. Apparatus for **pyroligneous acid.** Batteries of retorts, steam supply and superheaters, with condensers and supply tanks so arranged that any one of the units of the apparatus can be removed or cut out without interfering with the operation of the other units.

737,099. Charles C. Hall, Alexandria, Ind. Assignor to American Insulating Material Manufacturing Co., St. Louis, Mo. **Mineral wool felt.** The mineral wool is placed in a tank containing 800 parts of water having wood pulp 40, flour 10, and alum 1, through which diffused blasts of air are forced to disintegrate the fibers which are then settled on a screen, drained and dried.

737,116. Edward M. Knight, Brooklyn, N. Y. **Filtering medium.** A pad composed of several layers of fibrous material with interposed layers of carbon, the outer edges of the fibrous pads being interlocked.

737,123. Florentine J. Machalske, Chicago, Ill. Making **carbon chlorides.** One-half assigned to Charles Herbert Lyon, same place. Carbon chlorides and sulphur are produced by heating a mixture of coke, sodium chloride, silica and sulphur in an electric furnace.

737,233. John B. F. Herreshoff, New York, N. Y. Assignor to General Chemical Co., same place. **Absorber for making sulphuric acid.** A jacketed vessel has an inverted cone near the bottom thereof in which is a perforated plate, and supply pipes so arranged as to keep the level of the liquid in said cone or funnel just above the perforated plate, above which is a cooling device.

737,236. Charles N. Holmes, London, England. **Fibrous material.** The fiber is boiled in an alkaline solution, then treated with a mixture of water 4000, logwood extract 40, sumac extract 30, ferric sulphate 90, then dried and combed, and given a bath of glue 60, water-black 2, acetic acid 3, oleic acid 1 and water 650 parts by weight, then drying and combing the fiber which may be Mexican, Java or cocoanut.

737,249. Abraham Kronstein, Carlsruhe, Germany. **Thick oils.** Vegetable oils and resin are mixed and heated till the mixture solidifies; the heat is then raised till the mass melted.

737,285. Charles B. Schoenmehl, Waterbury, Conn. **B** **element.** A wedge-shaped compressed plate, thin edge of oxide of copper.

737,334. James S. Burns, Ann Arbor, Mich. Assignor on to George P. Goodale, Detroit, Mich. **Artificial stone.** S silicate 8, copperas 4, salt 5, sulphuric and hydrofluoric aci part each), and water holding 2 parts of litharge in suspens mixed and applied to a mixture of Portland cement and sar while curing, the stone is treated with dilute nitric acid.

737,421. Axel Krefting, Christiana, Norway. Assig Ernest Herrmann, Paris, France. **Glutinous substances** **seaweed.** Seaweed is dissolved in sodium carbonate an cipitated by lime milk, filtered off and CO_2 passed into th tion to regenerate the soda, the solution being used to dis fresh lot of seaweed. The product is tangate of lime.

737,432. Julius Meinl, Vienna, Austria-Hungary. **substitute.** Cocoa beans are cleaned, roasted and crushed is converted into dextrin and roasted at 75° C., mixed wi beans and the mixture ground.

737,445. Eduard Muench, Ludwigshafen-on-Rhine, Ger Assignor to Badische Anilin und Soda Fabrik, same place. **brown azo dye.** Obtained from anthranilic acid and *p*- soluble in warm water and in concentrated sulphuric aci yellow-red color, and on reduction gives anthranilic ac amino-*p*-cresol.

737,468. Arthur M. Pierce, Brooklyn, N. Y. Assig Bradford L. Gilbert and Wm. H. Peddle, of New York, **Fire-proofing wood.** The wood is saturated with a solu fire-proofing salts as borax and ammonium sulphate and th a monatomic alcohol, which is afterwards drawn off and th dried.

737,529. Alfred H. Thieme, Springfield, Mass. I **hangers' size.** Ground glue 40, sugar 14, water 41, is 4, and alum, salicylic acid and an essential oil ¼ part eac

737,557. Richard J. Friswell, London, England. A one-half to the British Uralite Co., same place. **Flexibl** **resisting material.** Finely divided asbestos is pulpe chalk, formed into sheets and sprayed with an alkaline and sodium bicarbonate, so as to leave 3 to 7 per cent. o in the sheets.

WILLIAM H. SEA

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GENERAL AND PHYSICAL CHEMISTRY.

The Rates of the Reactions in Solutions Containing Ferrous Sulphate, Potassium Iodide and Chromic Acid. BY CLARA C. BENSON. *J. Phys. Chem.*, 7, 356–388, 1903.—By a large number of experiments it is shown that the speed and the reaction order of the oxidation of ferrous sulphate and potassium iodide by chromic acid are very different according as the two are oxidized together or separately.

Since the experimental results cannot be explained by assuming the formation of iron peroxide or by adopting any of the explanations that have previously been offered, the new hypothesis is advanced that ferrous ion and iodide ion together form an ion $\overset{+}{\mathrm{FeI}}$, the oxidation of which is the main reaction. The author admits, however, that the assumption of such a reaction is not alone sufficient to account for all the facts. G. N. LEWIS.

The Influence of Dissolved Gases in Conductivity for a Direct Current. BY S. L. BIGELOW. *J. Phys. Chem.*, 7, 327–347, 1903.—The author measured the residual current at intervals of one-half minute to ten minutes after establishing an E. M. F. of 1 volt between two platinum electrodes immersed in sulphuric acid. He shows that the current is greatly diminished by exhausting the air from the electrolyte or by bubbling carbon dioxide through and increased by bubbling oxygen or hydrogen through. Increasing the concentration of the acid, and thereby increasing its conductivity, does not increase the current, but if instead of acid almost pure conductivity water is used, the current increases with the conductivity of the water.

The author believes that all these facts which, to the reviewer, seem entirely explicable on the basis of the accepted theory of Helmholtz, demand a new theory, and he accordingly advances one.

An increase in temperature causes a greater current immediate after the circuit is closed, a smaller current later. This th author very plausibly explains as due to the fact that the sol bility of gases decreases with increasing temperature, while th diffusibility increases. G. N. Lewis.

Equilibrium in the System Composed of Sodium Carbonat Sodium Bicarbonate, Carbon Dioxide and Water. By Herber N. McCoy. *Am. Chem. J.*, **29**, 437–462, 1903.—A solution sodium bicarbonate breaks up to some extent according to the equ tion, $2\overset{-}{HCO_3} = H_2CO_3 + \overset{=}{CO_3}$. By the mass law $\frac{C^2_{HCO_3}}{C_{H_2CO_3}C_{CO_3}} = K$ To determine the constant K, the author shook with air solution containing sodium carbonate and bicarbonate in varying propo tions. When equilibrium was reached, the proportion of the two was found by analysis of the solution. The concentration carbonic acid in solution was calculated from analysis of the a and from the known solubility of carbon dioxide. With a seri of solutions all tenth-normal in sodium, but varying widely in th proportion of carbonate and bicarbonate present, 5320 was o tained as the most probable value of K, while individual dete mination differed, on the average, several per cent. from this valu According to these measurements, a dilute solution of any we dissociated bicarbonate is, in a closed space, 2.68 per cent. d composed according to the above equation. This decompositi is, therefore, of much greater extent than the hydrolytic dissoci tion, $\overset{-}{HCO_3} + H_2O = H_2CO_3 + \overset{-}{OH}$, studied by Walker (*Ztsch phys. Chem.*, **32**, 137). The author calculates that a tenth-norm solution of bicarbonate is 2.9×10^{-6} normal in hydroxyl ion and i therefore, only one-twentieth as alkaline as it would be if hydr lytic dissociation alone occurred. The author unfortunately o scures his discussion by applying the term, hydrolytic dissoci tion to both reactions.

Values for the degree of hydrolysis of normal carbonate and f the dissociation constant of carbonic acid relative to the seco hydrogen ion, are also calculated and compared with previous d terminations. The author finally calculates from his data, a from the average amount of carbon dioxide in the air, that tent normal bicarbonate should reach equilibrium with ordinary a when 60 per cent. is converted into carbonate. This was ve closely verified by experiment. G. N. Lewis.

Adherence of Electrolytic Metal Deposits. By C. F. Bu gess and Carl Hambuechen. *J. Phys. Chem.*, **7**, 409–415, 1903.- The authors discuss the conditions upon which the tenacity of a electrolytic deposit depend. G. N. Lewis.

Chemical Potential and Electromotive Force. BY WILDER D. BANCROFT. *J. Phys. Chem.*, 7, 416–427, 1903.—The author shows how the equations for electromotive force developed by Nernst and Planck can be derived from Willard Gibbs' conception of the electromotive force as a measure of chemical potential. The paper consists in part of sections of a letter written by Gibbs to the author. G. N. LEWIS.

Electrochemical Analysis and the Voltaic Series. BY J. E. ROOT. *J. Phys. Chem.*, 7, 428–465, 1903.—This paper is based on a large number of determinations of the dependence of the current upon the electromotive force in the electrolysis of the solutions most frequently used for electrochemical analysis. The figures given are for an electrolytic cell of arbitrary dimensions and no great accuracy is attempted. The experiments do not show the necessity of changing materially the present methods of electrolytic analysis. G. N. LEWIS.

A Determination of the Heat of Fusion of Ice. BY ARTHUR W. SMITH. *Phys. Rev.*, 17, 193–232, 1903.—The heat of fusion of ice, notwithstanding its importance, has received scant attention from experimenters. Therefore this work is very welcome, in which a well-designed method is carried out with careful attention to detail and close scrutiny of possible sources of error. A well-insulated calorimeter was filled with a petroleum oil and small cubes of pure ice below 0°. Within were a stirrer and an electric heating coil. The whole calorimeter was slowly heated by the coil, (1) to about $-1°$, (2) to complete fusion of the ice, (3) to about $+0.5°$. The first and last steps gave material for determining the heat capacity before and after melting, and knowing this the heat of fusion was calculated from the heat consumed in the second step. The heat given to the calorimeter was found by observing the potential at the ends of the coil, the current through the coil and the time during which the circuit was closed. The current was measured by determining the potential at the terminals of a standard resistance in circuit. The time (ten to thirty minutes) was measured on an ordinary watch. The author claims that the error could not exceed one-tenth second, but this seems doubtful. A stop-watch started and stopped by the same motion that made and broke the circuit would, perhaps, have been safer. Errors due to loss of heat by radiation, evaporation, etc., to heat produced in stirring, to electrolysis of water, to the influence of the oil on the ice and water, to the use of the thermometer, were shown to be absent or were corrected for.

The observation made by previous observers, that the apparent specific heat of ice changes rapidly in the neighborhood of the melting-point was shown to be due to incipient melting and only true of impure ice.

The final value of the heat of fusion of ice, obtained as the weighted mean of eight experiments is 334.21 ± 0.08 joules. The average deviation of individual experiments from this mean is 0.24 joules. The potential of the standard Clark cell is taken as 1.434V at 15°. If one mean calorie is taken as 4.1832 joules the heat of fusion is 79.896 mean calories. Probably the author does not mean to claim quite such a high degree of accuracy as these figures would indicate. G. N. LEWIS.

The Heat of Vaporization of Air. BY J. S. SHEARER. *Phys. Rev.*, **17**, 469–475, 1903.—By a method described in a previous review (**25**, 267) the heat of vaporization of pure oxygen and nitrogen were found to be 61.0 and 49.8 cal. respectively. The same quantities calculated by Clausius' equation from the vapor pressures are 60.8 and 49.2 cal. The compositions of the gaseous phase above liquid mixtures of oxygen and nitrogen in different proportions were determined. The heat absorbed in the vaporization from a mixture is approximately equal to the sum of the heats absorbed in vaporizing corresponding quantities of oxygen and nitrogen from the pure liquids. G. N. LEWIS.

A Method of Determining Internal Resistance, Applicable to Rapidly Polarizing Cells. BY J. R. BENTON. *Phys. Rev.*, **16**, 253–254, 1903.—The author proposes an arrangement for determining the resistance of cells, for the details of which reference must be made to the original article. G. N. LEWIS.

The Specific Heat of Solutions. BY WILLIAM FRANCIS MAGIE. *Phys. Rev.*, **17**, 105–116, 1903.—In continuation of previous work (this Review, **22**, 11; **23**, 153; **24**, 443), the author determines the molecular heats in the solid states and the heats of solution of a number of organic substances. Neither of these quantities prove, as a rule, to be the same for two isomers. The molecular heat in the solid and liquid states and in the state of solution are discussed in relation to the formula of Staigmüller (*Wied. Ann.*, **65**, 655). The author seems to realize that this formula, which was derived for gases from a very hypothetical basis becomes much more untrustworthy when applied to solutions, solids, and liquids, but believes that his results justify its use. Those, on the other hand, who are inclined to look askance at such formulas, will welcome the present work as a *reductio ad absurdum*. For example, according to the author, the specific heat of benzene at 6° shows just one degree of freedom for the hydrogen atom. That at 100° shows two degrees of freedom. The natural query is, what does the specific heat at some intermediate temperature show? G. N. LEWIS.

The Pressure Due to Radiation. BY E. F. NICHOLS AND G. F. HULL. *I. Phys. Rev.*, **13**, 307–320, 1901; *II. Phys. Rev.*, **17**, 26–50 and 91–104 (1903): *Proc. Am. Acad.*, **38**, 557–599, 1903. *Drude's Ann.*, **12**, 225–263, 1903.—In the first of these papers it was shown experimentally, as Lebedew had also shown in the preceding year (*Rapports au Congr. Internat. de Phys.*, **2**, 133, 1900), that the pressure exerted by a ray of light is not far from that calculated by the formula of Maxwell and Bartoli. In the later paper the author succeeded in reducing experimental errors and in obtaining an experimental value for the pressure of light within 1 per cent. of that calculated from the electro-magnetic and thermodynamic theories, a remarkable achievement considering the great difficulties that previous experimenters in this field have encountered.

The method consists briefly in throwing a beam of light of known intensity upon a silvered glass vane suspended on a fine torsion balance. No attempt was made to obtain the highest possible vacua as in the experiments of Lebedew but the influence of gas action was otherwise eliminated. Experiments showed that this action changed from pressure to suction and therefore passed through zero at two different pressures, one between 11 and 20 mm., the other between 0.05 and 0.02 mm. The former region was chosen for the measurements. Since the pressure of the light on the vanes is independent of the time, while the gas action increases as the vane is warmed, the ballistic method was employed, with short exposures. It was thus possible to reduce the gas action to a fraction of one per cent. of the whole pressure. In order to show that the law is the same for all kinds of light, different screens were used. The final results are given in the following table:

	Observed values in 10^{-5} dynes.	Computed values in 10^{-5} dynes.	Observed—Computed in percentages.
Through air	7.01 ± 0.02	7.05 ± 0.03	—0.6
Through red glass	6.94 ± 0.02	6.86 ± 0.03	+1.1
Through water	6.52 ± 0.03	6.48 ± 0.04	—0.6

G. N. LEWIS.

Preliminary Note on the Selective Absorption of Organic Compounds. BY WM. W. COBLENTZ. *Phys. Rev.*, **16**, 385–389, 1903.—The ultra-red absorbtion spectrum of 38 compounds was explored as far as 12 or 15μ. The results show, in general, that the absorption depends largely on the arrangement of the atoms in the molecule. A discussion of the details may be advantageously postponed until the publication of more complete results, which the author promises. G. N. LEWIS.

General Law for Vapor Pressures. BY SANFORD A. MOSS. *Phys. Rev.*, **16**, 356–363, 1903.—The author shows that the law of vapor pressures given by Ramsay and Young may be put into the form, $\frac{1}{T_b} = C\frac{1}{T_a} + k$, where "$T_a$ and T_b are any absolute temperatures of any two substances, which correspond to the same vapor pressure, and C and k are constants for each pair of substances." One of the advantages of this form of the equation is that if $\frac{1}{T_b}$ and $\frac{1}{T_a}$ are plotted, the resulting curve is a straight line. Any deviation from the equation thus becomes obvious.

Assuming that the vapor pressure curve of water satisfies Rankine's formula, the following general equation for the vapor pressure of any substance is obtained, where m and n are specific constants for each substance, T is absolute temperature, and p is pressure in mm. of mercury.

$$\text{Log.}\, p = 13.756 - \left(m + \frac{n}{T}\right)^2.$$

G. N. LEWIS.

A Novel Concentration Cell; A Thermo-Electric Theory of Concentration Cells; Thermo-Electromotive Force Without Difference of Temperature; The Role of Thermo-Electromotive Forces in a Voltaic Cell. BY HENRY S. CARHART. *Trans. Am. Electrochem. Soc.*, **1**, 105–109, 1902; **2**, 123–129, 1902; **3**, 137–142, 1903; *Phys. Rev.*, **16**, 248, 1903.—In these papers a view of voltaic cells is proposed, the results of which, in some respects, are in agreement with the accepted facts of electrochemistry, but in others are direct contradictions of the principles of thermodynamics. For example, the author believes that a true concentration cell may be constructed in which the current flows in such a direction as to increase the concentration difference. As proof he shows, in the paper entitled "A Novel Concentration Cell," that when a cell is composed of two nickel electrodes, and two solutions of nickel sulphate of different concentrations, the current flows from the strong to the dilute. This is doubtless a fact, but the question is, what is the reaction which accompanies the passage of the current? Under ordinary circumstances nickel in a nickel salt is not a reversible electrode. If, as is not unlikely, the nickel electrodes act in this case as oxygen electrodes, then if both solutions are saturated with air, the direction of the current will depend not upon the concentration of nickel sulphate but upon the relative acidity of the two solutions.

G. N. LEWIS.

The Thermo-Electric Behavior of Nickel Nitrate. BY WM. MCCLELLAN. *Phys. Rev.*, **17**, 255–266, 1903.—The potential is measured of a cell composed of two platinum electrodes in nickel nitrate solution, one end being kept hot, the other cold. In air-free solutions the potential is nearly zero, from which the author concludes that "the thermo-electric power of the electrolyte used is nearly zero." The author makes the too common mistake of neglecting to consider the nature of the change produced in the

cell by a current. It is obvious that with platinum electrodes absolutely free from gas in a pure solution of nickel nitrate or any similar electrolyte, there would be no possible reaction or change under the above conditions which could give rise to an electromotive force.
G. N. LEWIS.

History of the Water Problem. BY J. W. MELLOR. *J. Phys. Chem.*, **7**, 557–567, 1903.—The author brings to light a paper of Mrs. Fulhame, published in 1794, in which it is pointed out that a large number of reactions occur only in the presence of water and the theory is advanced that the water takes part in an intermediate reaction, being used up and again formed. It is an interesting contribution to the history of catalysis.
G. N. LEWIS.

Electrolytic Copper Refining. BY F. J. SCHWAB AND I. BAUM. *J. Phys. Chem.*, **7**, 493–531, 1903.—With the view of finding the most favorable conditions for the commercial refining of copper the authors investigate the influence of temperature, current density, etc., on the quality of copper produced and on the expense and the efficiency of the process. They conclude that copper can be most economically produced in copper tanks at 70° C. with a current density of $3^1/_2$ to $3^3/_4$ $\frac{\text{amp.}}{\text{sq. dm.}}$ A small impurity of iron does not seem to reduce the efficiency as other experimenters have claimed.
G. N. LEWIS.

The Composition of the Surface Layers of Aqueous Amyl Alcohol. BY CLARA C. BENSON. *J. Phys. Chem.*, **7**, 532–536, 1903. —The phenomenon observed by Zawidski (*Ztschr. phys. Chem.*, **35**, 77), namely, the difference in concentration between a foam and the liquid from which it is produced, is found to occur also with solutions of amyl alcohol in water. The foam contains a larger proportion of the alcohol than the original solution.
G. N. LEWIS.

Some Phenomena of Electrolytic Conduction. BY C. J. REED. *Trans. Am. Electrochem. Soc.*, **2**, 235–244, 1902.—When solutions of copper sulphate and sulphuric acid of the same density are separated by a porous membrane and a current is passed from the copper sulphate solution to the sulphuric acid, the level of the latter rises, that of the former falls. The author divides the electrolyte by porous membranes into a number of compartments, some filled with one solution and some with the other, and analyzes the contents of each compartment after the passage of the current. Being apparently unfamiliar with the phenomenon of electric endosmosis, he considers that the results show errors in the accepted transportation values of the ions.
G. N. LEWIS.

Note on the Gladstone-Tribe Couple. By Wilder D. Bancroft. *Trans. Am. Electrochem. Soc.*, 1, 65–67, 1902.—The author points out that although the action of the Gladstone-Tribe copper-zinc couple is undoubtedly electrochemical, it has not always been possible to reproduce its results by means of a common voltaic cell. He shows that this can be done in certain cases by suitably choosing solvent and temperature.

G. N. Lewis.

The Electrolytic Rectifier. By C. F. Burgess and Carl Hambuechen. *Trans. Am. Electrochem. Soc.*, 1. 147–161, 1902. —The author shows that in the electrolytic rectifier the whole aluminum plate does not serve as electrode but only certain points upon it, the rest of the electrode remaining permanently coated with oxide. The leakage in the cell, that is the passage of the current in the wrong direction, is the chief cause of inefficiency. Experimental curves are given for this leakage when different electrolytes are used. With molten salts as electrolytes, low leakage and a high efficiency are obtained. G. N. Lewis.

The Reversible Copper Oxide Plate. By Woolsey Mc.A. Johnson. *Trans. Am. Electrochem. Soc.*, 1, 187–193, 1902.—The commercial copper oxide electrode in caustic potash shows a poor efficiency except for a very slow discharge rate. During discharge the potential falls by stages, as several different oxides are successively formed. The cupric oxide electrode has a potential of 0.730 volt and the cuprous oxide electrode a potential of 0.438 volt against hydrogen in the same electrolyte. G. N. Lewis.

Differences of Potential between Metallic Cadmium and Solutions of Cadmium Iodide in Various Solvents. By Louis Kahlenberg. *Trans. Am. Electrochem. Soc.*, 2, 89-91, 1902.—The electromotive force is given for fifteen cells of the form Cd, CdI_2, in X, against a normal electrode. X represents in each case some nitrile or amine. The values range from $^1/_2$ to 1 volt.

G. N. Lewis.

The Influence of Some Impurities in Salt upon the Yield of Caustic Soda by the Amalgam Process. By J. Wallace Walker and Chas. S. Paterson. *Trans. Am. Electrochem. Soc.*, 3, 185–194, 1903.—In a study of the commercial method of making caustic from sodium chloride by the amalgam process, a remarkable influence of certain impurities in the salt upon the yield of caustic is observed. The ordinary impurities, magnesium, calcium, and potassium, have no influence upon the yield of sodium amalgam, but the slightest trace of nickel causes the deposition of hydrogen in place of sodium, one part in 10,000 causing a loss in yield of 30 per cent. An iron salt added to pure salt has no effect, but when added to salt containing impurities of magnesium or calcium it causes even greater loss than nickel. One part in 100,000 causes a loss of 30 per cent. The loss in efficiency is associated with the formation of a solid scum on the amalgam. The authors believe that the phenomenon is due to the formation of some compound between sodium and the impurity, which rapidly decomposes water, but local action, due to formation on the surface of the amalgam of some substance on which the over-voltage is small, seems a more likely cause. G. N. LEWIS.

Ionic Velocities in Liquid Ammonia Solutions. BY EDWARD C. FRANKLIN AND HAMILTON P. CADY. *Electrochem. Industry*, **1**, 8, 1902.—The molecular conductivity at infinite dilution of an electrolyte is, as a rule, greater in liquid ammonia than in water, thus indicating a greater mobility of the ions. Direct measurements of the ionic velocities in liquid ammonia at—33°, made by observing the rate at which a meniscus travels, gave the following results :

$\overset{+}{\mathrm{NH_4}}$, 0.00133 ; $\overset{+}{\mathrm{K}}$, 0.00167 ; $\overset{+}{\mathrm{Na}}$, 0.00132 ; $\overset{+}{\mathrm{Ag}}$, 0.00103 ; $\overset{-}{\mathrm{NO_3}}$, 0.00166 ; $\overset{-}{\mathrm{Br}}$, 0.00168.

These velocities, measured in cm. per sec. for a potential gradient of 1 volt per cm., are from two to three times as great as the corresponding velocities in water at 18°, and they agree fairly well with the results obtained from conductivities.

G. N. LEWIS.

Experimental Determination of the Single Potentials of the Alkali Metals, Sodium and Potassium. BY HARRISON EASTMAN PATTEN AND WILLIAM ROY MOTT. *Electrochem. Industry*, **1**, 450–451, 1903.—The potentials of sodium and potassium in a number of different solutions were measured against a normal electrode, the potential of which is taken as—0.56 volts. The potentials ranged from 1.9 to 2.2 volts for sodium, from 2.1 to 2.6 volts for potassium. The fact that these potentials are nearly alike when different solutions are used suggests to the reviewer the suspicion that the potential measured is, in most cases, that between the metal and a thin film of its hydroxide. As one of the electrolytes lithium chloride in very cold alcohol was used, after the example of Haber and Sack (*Ztschr. Electrochem.*, **8**, 245), and Reuter *Ztschr. Electrochem.*, **8**, 80). To the reviewer it seems as inexcusable to measure the potential of sodium or potassium in lithium chloride as it would be to measure that of zinc in copper sulphate. G. N. LEWIS.

Diffusion and Supersaturation in Gelatine. BY HARRY W. MORSE AND GEORGE W. PIERCE. *Proc. Am. Acad.*, **38**, 623–648; *Phys. Rev.*, **17**, 129–150 ; *Ztschr. phys. Chem.*, **45**, 589–607.—Liesegang has shown that when silver nitrate diffuses into a tube containing potassium chromate in gelatine, silver chromate is precipitated, not evenly throughout the tube, but in thin, separate layers. Ostwald has attributed this phenomenon to successive supersaturation and sudden precipitation of the silver chromate, and offers it as evidence of the existence of a metastable limit, that is, of a definite concentration greater than that of the saturated solution at which precipitation begins in the absence of germs of the solid phase.

The authors have studied this phenomenon with the view of obtaining evidence concerning the preciseness of such a metastable limit from the degree of regularity in the formation of the layers. In order to produce a given concentration of silver chromate there must be for every concentration of silver-ion a fixed concentration of chromate-ion. For the metastable limit we should have, according to the mass law,

$$\overset{+}{\mathrm{Ag}}{}^{2} \times \overset{-\,-}{\mathrm{CrO_4}} = \mathrm{H},$$

where H is the so-called metastable constant and $\overset{+}{\mathrm{Ag}}$ and $\overset{-\,-}{\mathrm{CrO_4}}$ are the concentrations of the two ions.

From the theory of diffusion, the metastable limit should be reached and the layer formed according to the law $x/\sqrt{t} =$ const., when x is the distance of the layer from the beginning of the tube and t is the time from the beginning of the experiment. This prediction is surprisingly well verified by the experiments, the above quotient being constant for a given tube to one or two-tenths of a per cent., thus showing that under given conditions the concentration of silver-ions necessary to cause precipitation in a given chromate solution is constant. When different tubes were used, as nearly alike as possible, the quotients differed more widely, frequently by 1 per cent. or more.

By using different strengths of both solutions it was possible to calculate by means of a set of interesting equations both the metastable constant of silver chromate and the diffusion constant of silver nitrate. The value obtained for the former was 1.4×10^{-6}, for the latter 1.54, both for 16°C., and both expressed in the customary units. G. N. LEWIS.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

Geology Under the New Hypothesis of Earth-Origin. BY HERMAN LEROY FAIRCHILD. *Am. Geologist*, 33, 94–116.—Professor T. C. Chamberlain has formulated a new hypothesis of earth-origin, the full presentation of which will appear in a new text-book of geology, which is in course of preparation by himself and Professor R. D. Salisbury. "The new hypothesis holds that the disseminated planet-forming matter *had lost its heat* while yet existing in the loose form, as rings or zones or wisps of the parent nebula, and that the globular planets were *formed by the* *slow accretion or infalling of cold, discrete bodies or particles* ('planetesimals')." In the paper under review the author indicates the bearings of the new hypothesis on several problems in geology and shows how these problems are thereby simplified. "It is predicted that under the stimulus of the new thought so many changes will be made in our views of geologic processes that the science of geology will be rejuvenated, as its theoretic or philosophic advance has been seriously retarded by its dependence on a false conception of earth genesis." W. F. HILLEBRAND.

Cement Resources of Alabama. *Senate Document No. 19, 58th Congress, 1st Session*, 23 pp., map. Washington : Government Printing Office.—This is a report submitted by the Director of the U. S. Geological Survey. It consists of two parts : (1) *The Materials and Manufacture of Portland Cement*, pp. 2–11, by Edwin C. Eckel, and (2) *Portland Cement Materials of Central and Southern Alabama*, pp. 12–23, by Eugene A. Smith. It is untechnical and contains over one hundred analyses, chiefly of limestones, which were largely made in the laboratories of the State University. W. F. HILLEBRAND.

The Coal Resources of the Yukon, Alaska. BY ARTHUR J. COLLIER. *U. S. Geol. Survey Bull., No. 218*, 71 pp. plates, figures, maps. "The coals of the Yukon Basin occur in sandstones of Tertiary and Cretaceous age and present great variations in quality. ....They range from high grade lignites to semibituminous coals." The analyses, many of which were made in the survey laboratory, show in a number of cases a composition comparing favorably with that of coals classed as bituminous in the eastern United States. For the purpose of distinguishing between lignites and bituminous coals from the analytical data, the author proposes a ratio—the lignite ratio—which is the quotient of the water content divided by the fuel ratio. On the assumption that a coal, to be a lignite, must have a water content of over 10 and a fuel ratio of less than 1, the lignite ratio will be over 10 for a lignite and less than 10 for a bituminous coal. "By the use of this ratio, the physical character of the coal being neglected, it is found that nearly all the coals that have been classed as lignites by physical character alone fall readily into that class, while the bituminous coals are as certainly distinguished." Coals on the border line, with a lignite ratio of 9 to 11, should be classed as intermediate, and for them the term "lignitic coal," already used in a similar sense, might be adopted. The coal beds of the Yukon, although sufficient to supply all probable demands, will hardly afford material for exportation. W. F. HILLEBRAND.

Genesis of the Amphibole Schists and Serpentines of Manhattan Island, New York. BY ALEXIS A. JULIEN. *Bull. Geol.*

Soc. Am., **14**, pp. 421–494; plates.—The subject is most elaborately treated from all points of view, and as a result the hypothesis of derivation of these rocks from alteration of ferruginous sediments and from amphibolization of limestone are discarded in favor of that which regards them as altered basic igneous intrusions. Conclusions are also presented concerning the paragenesis of hornblende, epidote, and quartz. Certain features of the analyses, made for the author by C. H. Jouët, of micaceous gneiss and hornblende schist, are open to question. Their summation is very low, as is also the water, which was determined as loss on ignition, notwithstanding that the rocks contained 6.50 and 13 per cent., respectively, of ferrous oxide. It is possible that the water should be given much higher, whereby the summation would be improved. Singular too, in rocks of this character, is the reported complete absence of titanium.

W. F. Hillebrand.

The Ore Deposits of Tonapah, Nevada. By J. E. Spurr. *Eng. and Min. J.*, **76**, 769–770.—An author's abstract of Bulletin 219, of the U. S. Geol. Survey, already noticed in this Review, **26**, R51.

W. F. Hillebrand.

Theories of Ore Deposition Historically Considered. By S. F. Emmons. *Eng. and Min. J.*, **77**, pp. 117–119, 157–159, 199–200, 237–238.—A presidential address delivered before the Geological Society at St. Louis.

W. F. Hillebrand.

Notes on the Rocks of Nugsuaks Peninsula and its Environs, Greenland. By W. C. Phalen. *Smithsonian Miscel. Collections, Quarterly Issue*, *1*, 183-212, map, plate.—Nugsuaks peninsula lies between the parallels of north latitude 69° 55′ and 70° 57′ on the west coast of Greenland. The field relations of the rocks described are not known in any detail. The following analyses by the author accompany his descriptions:

	1.	2.	3.	4.	5.	6.	7.
SiO_2	69.07	76.03	47.80	42.79	42.63	49.49	67.27
Al_2O_3	14.09	12.02	18.24	15.04	6.88	5.45	13.67
Fe_2O_3	1.49	0.69	0.35	5.44	3.33	1.04	1.83
FeO	2.37	0.68	9.27	11.61	7.27	3.39	2.49
MgO	0.98	0.18	8.08	11.00	29.36	15.88	1.72
CaO	3.14	1.61	11.44	10.24	5.90	24.07	1.90
Na_2O	5.18	2.97	2.24	2.89	1.26	0.82	2.79
K_2O	2.71	5.72	0.45	0.47	0.14	....	5.80
H_2O+	0.26	0.20	0.58	....	....	....	0.45
H_2O-	0.04		....	....	....	....	0.08
TiO_2	0.78	0.28	1.46	....	....	....	1.70
P_2O_5	trace	....	0.24	....	....	....	0.16
MnO	"	....	0.55	0.54	0.36	0.18	0.19
NiO	....	....	....	....	0.27	....	....
Cr_2O_3	....	....	....	....	0.05	....	....
	100.11	100.38	100.70	97.45	100.02	100.32	100.05

1. Gneiss. Umanak Island. Perhaps a differentiated portion of an original magma whose center is represented by 2. Albite, orthoclase, microcline, oligoclase, quartz, biotite, kaolin, sericite, apatite, zircon, sphene.

2. Granite (omeose) associated with 1 and probably of same genetic origin. Orthoclase, albite, microcline, oligoclase (kaolin, sericite) biotite, magnetite, zircon, epidote, cholrite, apatite.

3. Diorite (auvergnose). Umanak Island. Hornblende, labradorite (sericite, calcite), magnetite, pyrite, hematite, zircon, apatite, garnet.

4. Hornblende of unusual interest from another diorite. Umanak Island.

5. Periodotite (custerose). Kaersut, Nugsuaks Peninsula. Partial analysis. Olivine, augite, chlorite, feldspar, biotite, magnetite, limonite, hematite, apatit.

6. Pyroxene from peridotite var, picrite. Kaersut, Nugsuaks. Sp. gr. 2.89.

7. Quartz monzonite (dellenose). Atanekerdluk, Nugsuaks. Acid feldspar (albite,? oligoclase ?), labradorite (Ab_3An_4), amphibole, pyroxene, zircon, quartz, apatite, magnetite, hydrous iron oxide.

In addition to the above, a few others are more or less fully described: Syenite (Umanak), olivine gabbro, olivine basalt, and basalt bearing native iron (Kaersut). The iron in this last presents itself in two aspects, the one black, the other lighter, with a silvery sheen. W. F. HILLEBRAND.

METALLURGICAL CHEMISTRY.

Metal Production in the United States in 1903. *Eng. Min. J.*, January 7, 1904.—*Aluminum*, 7,500,000 pounds, valued at $2,325,000. The exports of crude and manufactured metal were $143,732. *Antimony* was not produced from domestic ores, but from foreign ores and in hard lead 6,976,778 pounds was produced, valued at $535,486. The imports of metal for eleven months were 5,007,915 pounds, valued at $274,363. *Copper*, 670,880,000 pounds, valued at $88,334,770; exports 272,000,604 pounds, valued at $36,200,667; imports 126,615,475 pounds, valued at $15,996,502. *Gold*, 3,600,645 troy ounces, value $74,425,340, from domestic ores, not including gold recovered from foreign ores and bullion. *Iron*, 17,942,840 long tons of pig-iron, value $265,554,032; imports 602,855 long tons; exports 17,111 long tons. *Lead*, 289,030 short tons, value $24,492,402, from domestic ores; 84,771 tons from foreign ores and bullion; imports 98,418 tons, value $3,510,043; exports 55 tons, value $6,156. *Nickel*, from foreign ores and matte only, 11,200,000 pounds, value $4,872,000. *Mercury*, 29,103 flasks, value $1,295,083; exports 1,280,298 pounds, value $672,700. *Silver*, from domestic ores, 56,519,793 troy ounces, value $30,520,688; imports value $21,895,893; exports value $34,119,689. *Zinc*, 156,318 short tons, value $16,882,344. J. W. RICHARDS.

Coal in 1903. BY S. SANFORD. *Eng. Min. J.*, January 7, 1904.—The total production of the world is estimated at 845,000,000 tons, of which the United States contributed 283,406,691 tons of bituminous coal, valued at $334,056,024, and 73,390,000 tons of anthracite, valued at $150,449,500; a total of 356,796,691 tons, valued at $484,505,524. The average value of bituminous coal at the mines was $1.30 per ton, of anthracite $2.05.

J. W. RICHARDS.

The Largest Steel Plant in the World. *Iron Age*, January 7, 1904. A 20-page, illustrated description of the Lackawanna Steel Company's new plant at Buffalo —The general design of the plant and most of its important details are due to Henry Wehrum. *The coking plant* has four batteries (of 47 ovens each) of the Otto-Hoffman type, and six batteries of the Rothberg type. They will coke 6000 to 7000 tons of coal per shift. The ovens are 16 inches wide, 6.5 feet high and 33 feet long, and it takes 30 hours to coke the charge. The yield of coke is 80 per cent., with 2 per cent. of tar and 2 pounds of ammonia per ton. *The ore-handling machinery* consists of five Hulett ore unloaders and three re-loaders, using ten-ton buckets. They each handle 200 up to 600 tons of ore per hour. *The bin* system stoves enough iron ore and limestone for a daily production of 3800 tons of pig iron. *The blast furnaces* are six in number, two of them 86 feet high, 11 feet diameter at tuyeres and 17 feet bosh ; blown by 16–4 inch tuyeres. Each has four central combustion stoves 18 feet diameter by 85 feet high, with a volume of 8275 cubic feet, heating surface 24,600 square feet, and heating the blast to 900° F. The gases pass into a 60-inch main, where they are washed by 12 water jets, and thence pass to the washing-plant. The gas going to the stoves is washed once, that to the gas-engines twice. The pig iron is cast by two Heyl and Patterson machines. The other four furnaces are 94 feet high, 24 feet diameter at the boshes, 17 feet at the tuyeres, capacity 20,400 cubic feet, number of tuyeres 20, blast pressure 18 pounds. Each has four stoves 20 feet in diameter by 135 feet high, having 56,800 square feet heating surface, and heating the blast to 1000° F. *The gas engines* are in three plants, No. 1 consisting of 8 Koerting 100 horse-power engines, driving dynamos ; No. 2 has eight 2000 horse-power Koerting engines, driving blowing cylinders, and No. 3 will be of like capacity. The blowing cylinders are 72 inch diameter, with 60 inch stroke running 160 strokes per minute, and are of the Southwark type each driven by a 2000 horse-power gas engine. The only difficulty so far met has been a sudden enrichment of the gas (in hydrogen) due to leaky tuyeres, resulting in strains on the gas engines. *The Bessemer Steel Works* use both direct metal and and remelted pig iron. The mixer has a capacity of 300 tons There are eight 9-foot iron melting cupolas, and four 7-foot spiegeleisen cupolas. There are four 10-ton converters, blown with air at 25 pounds pressure. *The open hearth plant* is being built six 50-ton stationary furnaces are in course of erection, and room will be provided for a larger number. Extended descriptions are also given of the rail, plate, slabbing and structural steel mills and the forge and machine shop. J. W. RICHARDS.

Side Blow Converters. BY N. LILIENBERG. *Iron Age*, January 14, 1904.—The bulk of side and surface blown steel has carbon not above 0.25 per cent. It has a place between open-hearth steel and crucible steel, for it would be too expensive to melt such low carbon steel in crucibles. By continuing the blowing until the carbon is about 0.10 per cent., a metal containing silicon 0.02, phosphorus 0.04, and manganese not over 0.04 can be made, which is very desirable for electrical purposes on account of the low manganese giving high magnetic permeability. The burning of the carbonic oxide inside the converter enables a superheated steel of this composition to be made. Since no air is driven through the metal, it is less oxidized than ordinary open-hearth, or bottom-blown Bessemer steel, and it may be practically called superheated dead-melted metal. The loss of metal is 14 to 17 per cent. in cupola and converter together. The bottom lasts about 25 heats and the upper lining 200 to 300. The blast is at 3 to 4 pounds pressure. The gases contain:

	Carbon monoxide. Per cent.	Carbon dioxide. Per cent.	Oxygen. Per cent.
At 4 minutes	0.00	8.2	..
At 10 minutes' boiling	0.30	24.3	..
At 12 minutes' boiling	0.40	8.8	..
At 17 minutes, short flame	10.70	12.0	7.0

The blow lasted twenty-one minutes. At the high temperature towards the end, the formation of carbon dioxide decreases, and there is free oxygen escaping. Ferro-manganese is added before casting. It is suggested that the use of ferro-silicon during the blow, or of an introduction of petroleum sprayed in at the tuyeres, might increase the temperature in the converter.

J. W. RICHARDS.

Tests of Metals at Watertown Arsenal. *Iron Age*, January 21, 1904.—Comparative tests were made of two steel ingots nearly alike in carbon, one containing no nickel and the other 3.25 per cent. nickel. On cutting sections, both showed spongy metals, but after hammering at forging heat the effacement of these defects was nearly complete in both. The initial tensile strengths were 54,000 pounds and 66,000 pounds, respectively; after heating to bright yellow and quenching in oil, 94,000 pounds and 156,800 pounds, respectively. Annealed at 1000° F., the tensile strengths became 76,000 pounds and 94,400 pounds, elastic limits 48,000 pounds and 74,000 pounds, elongations 11 per cent. and 19 per cent., contractions of area 42 per cent. and 57 per cent. Steels were tested by alternate loads of 10,000 to 55,000 pounds. A shaft from a 0.2 per cent. carbon ingot endured only 800,000 repetitions of 20,000 pounds per square inch; the same, oil tempered and annealed, endured 9,000,000 without rupture.

J. W. RICHARDS.

The American Copper Industry. BY H. J. STEVENS. *Iron Age*, January 7, 1904.—The estimated output in the United

States for 1903 is 700,000,000 pounds, of which Montana produces over one-third, Michigan over one-fourth, and Arizona about one-fifth. Michigan has increased her production notably, with 28,000,000 pounds gain over 1902. J. W. RICHARDS.

The Lunkenheimer Metal Melting Furnace. *Iron Age*, January 14, 1904.—Description of a rotary furnace on horizontal axis, fired by air and oil at one end, and with a tipping gear at the other. Two sizes are made to melt 500 or 1200 pounds of brass per heat, the fuel consumption being 2 to $2^{1}/_{2}$ gallons of oil per 100 pounds of metal melted. The lining lasts 300 to 400 heats. J. W. RICHARDS.

Casting Aluminum Bronze for Rolling into Sheet. BY E. S. SPERRY. *Metal Industry*, January, 1904.—This metal is more difficult than any other to cast into rolling slabs, even more so than German silver. The methods used for casting brass, *viz.*, in moulds open at the top, using oil, etc., were worthless, because the metal oxidized producing a slab dirty on the outside and penetrated by dross in the interior in every direction. An improvement was made by casting in a shallow open mould, like copper, so as to give the dross a chance to rise to the surface. The bronze is cast as cool as possible, the upper surface skimmed clear, and planed off when cold. This gives only fair results; the resulting sheet is often "patchy." The best results are obtained by having a large pouring-gate outside this mould, communicating with it by a deep tapering slot, through which the metal runs clean, leaving dross and skimmings behind in the gate. J. W. RICHARDS.

Electrical Losses in an Electrolytic Copper Refinery. BY C. T. HUTCHINSON. *Electrochemical Industry*, January, 1904.—The losses are (1) switchboard loss, including all losses from generators to the tank feeders, (2) feeder loss, including losses to the tanks, (3) loss in bus bars on the tanks, (4) contact losses from end of feeder to the solution, including (*a*) joint between feeder and tank main, (*b*) between tank main and anode rod, (*c*) between anode bar and anode hook, (*d*) between anode hook and anode plate, (*e*) between cathode plate and cathode bar, (*f*) between cathode bar and negative main. In a plant having 67 volts pressure at the generators, the losses amounted to 15.67 volts, or 23.5 per cent. of the whole, divided as follows:

(1) In switchboard.	0.31 volts =	0.46 per cent. =	2.0 per cent. of total loss
(2) In feeders	2.00 " =	3.00 " " =	12.8 " " " "
(3) In tank mains..	6.00 " =	9.00 " " =	38.4 " " " "
(4) In contacts	7.36 " =	11.00 " " =	46.8 " " " "
		23.46 " "	100.0 " " " "

J. W. RICHARDS.

Electrolytic Stripping of Metals. By C. F. Burgess. *Electrochemical Industry*, January, 1904.—Illustrated description of an installation for stripping brass from iron, using a sodium nitrate solution, in which the iron, as anode, takes the passive state. The electrolyte is one pound of sodium nitrate to a gallon of water, which has a resistance of 23 ohms per centimeter cube. A small amount of sodium nitrite makes the solution work better. During working, the alkalinity produced should be neutralized by the addition of a small amount of nitric acid each day, using litmus paper to determine when enough is added. The brass removed precipitates as a flocculent, greenish blue precipitate, and must be filtered out from time to time, The current density used is 5 to 15 amperes per square foot, the voltage 3 to 5. Silver, copper, tin, zinc, lead, cadmium and their alloys can be removed from iron in this way. Files which are clogged can be thus cleaned. J. W. Richards.

The Salt-Cake Process for Mixed Sulphides. By D. Clark. *Eng. Min. J.*, January 21, 1904.—This process was patented in 1902 by G. D. Delprat, for removing sulphides from complex ores. Salt-cake is dissolved in water to a specific gravity of 1.4; sulphuric acid is then added. The sulphides, ground fine, are introduced into this solution, when the sulphides at once rise to the surface, being lifted by the bubbles of hydrogen sulphide forming on them Up to 90 per cent. of the zinc sulphide in the ore may be thus removed. A plant capable of treating 1,000 tons per week, on this principle, is being erected at Broken Hill, Australia. J. W. Richards.

Cyanidation in the United States. By C. H. Fulton. *Eng. Min. J.*, January 7, 1904.—For treating slimes, the decantation process is applied extensively. The filter-suction process of C. Moore is working well; the Argo continuous filter-press consists of a traveling cloth belt on which the slimes are fed, and which passes, in one place, over the opening of a suction chamber, so that the dried slimes passing on contain only 13 to 15 per cent. of moisture. Direct wet crushing of ore in cyanide solution is still in the ascendency, whenever the nature of the ore permits it. The refining of precipitates has received much attention. At the Homestake mills, S. D., the zinc dust precipitates are taken from the filter presses, treated with hydrochloric acid to remove lime salts, then with sulphuric acid to remove zinc. The residue is filtered in presses, washed, partly dried, mixed with flux, litharge and powdered coke, briquetted, and the briquettes fused in a cupellation furnace to lead bullion, which is later cupelled, and slag which is re-treated with litharge in a small blast-furnace.
J. W. Richards.

Extracting Gold and Silver at Wallstreet Mills, Col. BY F. C. PERKINS. *Electrochemical Industry*, January, 1904. An illustrated description of the use of J. E. Greenwalt's electro-chlorination process. The ground ore is roasted, dropped into a pit and mixed with salt to chloridize the silver. It chloridizes 24 hours, by its own heat. The ore is regularly withdrawn nearly cold from the bottom of the pit, put into leaching vats 5 feet deep by 30 feet in diameter, having sand filter-beds in their bottom, and leached there with a solution containing originally 15 per cent. of sodium chloride and one-eighth per cent. of bromine as a bromide, and charged by electrolysis with free chlorine and bromine. The silver and gold of the ore are thus simultaneously dissolved. The solution is electrolysed between lead plates 1½ inches apart, with a current density of 0.028 ampere per square foot, the gold and silver being deposited as a slimy black powder. The solution is regenerated by passing it through the anode compartment of electrolytic cells, using graphitized carbon anodes, and perforated lead cathodes and salt as a cathode solution, using asbestos mill-board diaphragms. It is thus re-charged with free chlorine and bromine, and is used over for leaching the roasted ore. In the regenerating cells the current density used is 20 amperes per square foot, the drop of potential 4¼ volts per cell. Twelve cells containing anode plates, 4 inches by 20 inches and taking 400 amperes to a cell, will regenerate solution for treating 100 tons of ore daily.

J. W. RICHARDS.

Tin in California. BY J. MATHEWS. *Iron and Mach. World*, January 30, 1904 (from *Leslie's Weekly*).—The Santa Ana Mining Company are working a deposit in Trabuco Canon, discovered by J. A. Comer. The ore contains gold, tin and tellurium. It is stamped, cyanided for the gold, and then the cassiterite extracted on concentrating tables and smelted. J. W. RICHARDS.

The Bray Process of Manufacturing Tin Plate. *Iron and Mach. World*, January 30, 1904.—A description of the most recent American practise, dealing particularly with the rolling of the black plates. The saving is said to be $6.00 per ton of black plates made. J. W. RICHARDS.

Loss in Vanning of Tin Ores. BY R. PEARCE. *Eng. Min. J.*, January 21, 1904.—The accurate estimation of tin in an ore carrying less than 2 per cent. is a difficult operation. The only method in general use is the vanning test. In a sample containing 2.27 per cent. of tin, this test carefully made by three skillful operators, gave 1.78 per cent., or a loss of 21.5 per cent. of the tin actually present. If an ore contained less tin, the proportionate loss would probably be even greater.

J. W. RICHARDS.

A New Quicksilver Field. By W. B. Phillips. *Eng. Min. J.*, January 28, 1904.—This field is in Brewster County, Texas, and was discovered in the summer of 1903. It lies southeast of Chiso mountains, six miles from the Rio Grande, and is reached by a journey of 100 miles from Marathon, on the Southern Pacific Railway. The writer expects that large deposits will be uncovered in this region. J. W. Richards.

Molybdenum Ore. *Eng. Min. J.*, January 14, 1904.—The deposit of molybdenite at Crown Point, Washington, furnished 12 tons of rich ore in 1902. The mine is in the face of a cliff, 900 feet above the mining camp, and occurs as a horizontal vein two to three feet thick. J. W. Richards.

Production of Arsenic in 1903. By J. Struthers. *Eng. Min. J.*, January 14, 1904.—The Deloro mines, in Ontario, were shut down in April, 1903. All the arsenic produced in the United States came from the Puget Sound Reduction Co., at Everett, Wash., which made 590 short tons of arsenious oxide. The United States Arsenic Mines Co. is opening up a deposit at Pilot Mountain, seventeen miles from Christiansburg, Va. Considerable native arsenic has been found at Washington Camp, Santa Cruz Co., Arizona. J. W. Richards.

Production of Aluminum Ore in 1903. By J. Struthers. *Eng. Min. J.*, January 21, 1904—The development of the bauxite industry in Arkansas has largely increased the output in the United States, there being produced altogether 40,700 long tons, valued at $179,080, an increase of 50 per cent. over 1902.

J. W. Richards.

ORGANIC CHEMISTRY.

A Further Investigation of *p*-Toluenediazonium Sulphate and of the Action of Sulphuric Acid on the Methyl Ether of *p*-Cresol. By Gellert Alleman. *Am. Chem. J.*, 31, 24–45.—*p-Toluenediazonium Sulphate* was formed by dissolving *p*-toluidine in absolute methyl alcohol solution, cooling, adding concentrated sulphuric acid, and then passing in nitrous fumes. When pure, it forms colorless crystals, which are quite stable when dry. At the close of the diazotizing, and without separating the diazonium sulphate from the methyl alcohol, the temperature of the mixture was raised to the point of decomposition of the diazonium body. This occurs to a slight extent at ordinary temperature, but proceeds quite rapidly at 60°. The chief product of the reaction was *p*-methoxytoluene, with small amounts of toluene and dinitro *p*-cresol ($CH_3:OH:(O_2N)_2 = 1:4:3,5$). *p-Methoxy-m-toluenesulphonic Acid* ($CH_3:SO_3H:OH = 1:3:4$) was obtained by the action of sulphuric acid upon *p*-methoxytoluene. It crystallizes from alcohol in long colorless prisms, m.p. 105°–108°. *Salts.* $NaC_8H_9O_4S + 1/2H_2O$; efflorescent colorless prisms. $KC_8H_9O_4S + 2H_2O$; colorless needles or thin flakes, difficultly soluble in water. $Ca(C_8H_9O_4S)_2 + 4\ 1/2C_2H_5OH$; colorless transparent crystals (from alcohol), resembling distorted octahedra. $Ca(C_8H_9O_4S)_2 + 12H_2O$; long transparent colorless monoclinic prisms. $Mg(C_8H_9O_4S)_2 + 8H_2O$; colorless prisms. $Cu(C_8H_9O_4S)_2 + 6\ 1/2H_2O$; needles of a light blue or light green color. $Zn(C_8H_9O_4S)_2 + 6\ 1/2H_2O$; efflorescent colorless prisms. $Pb(C_8H_9O_4S)_2 + 3H_2O$; colorless needles. When *p*-methoxy-*m*-toluenesulphonic acid is fused with potassium hydroxide at 180°–200°, *p*-hydroxy-*m*-toluenesulphonic acid is obtained; at higher temperatures the product appears to be homopyrocatechol *p-Methoxy-m-toluenesulphone Chloride*, from the dry sodium salt and phosphorus pentachloride, crystallizes from acetone in colorless plates, m.p. 83.5°–84°. With ammonia, it yields the corresponding *Sulphonamide*, which crystallizes in needles, m.p. 180°–181°. *p-Methoxy-m-sulphaminebenzoic Acid* was obtained by oxidizing *p*-methoxy-*m*-toluenesulphonamide with potassium permanganate solution. It crystallizes from alcohol in needles or plates, m.p. 276°–277°. *Salts.* $NaC_8H_8O_5NS + 3H_2O$; transparent needles of a light cream color. $KC_8H_8O_5NS + 1\ 1/2H_2O$; fine needles nearly colorless. $Ca(C_8H_8O_5NS)_2 + 5H_2O$; white glistening needless. $Ba(C_8H_8O_5NS)_2 + 4\ 1/2H_2O$; colorless needles. $Mg(C_8H_8O_5NS)_2$; two forms were observed, one containing six molecules of water and the other ten and a half. *p-Hydroxysulphaminebenzoic Acid* results when *p*-methoxysulphaminebenzoic acid is cautiously fused with potassium hydroxide. It crystallizes from alcohol in needles, melting at 258°, and decomposing at about 265°. *Salts.* $NaC_7H_6O_5NS + 4H_2O$; white needles. $Ba(C_7H_6O_5NS)_2 + 6\ 1/2H_2O$; white tufts. When *p*-methoxy-*m*-sulphaminebenzoic acid is fused with potassium hydroxide at higher temperatures, protocatechuic acid is formed.

M. T. BOGERT.

The Chemical Composition of Nuts used as Food. BY J. B. WEEMS AND ALICE W. HESS. *Proc. Iowa Acad. Sci.*, **10**, 108–111.—The following Iowa nuts were analyzed: native hickory nut, native walnut, English walnut, almonds, filberts, pecans, peanuts, and chufa nuts. The edible portion of these nuts varies from 22 per cent. in the case of the native walnut to 70 per cent. in unroasted peanuts. The composition of the nut kernels (except the chufa nuts) may be gathered from the following extremes: (1) *Water*, pecans 2.8 per cent., English walnuts 6.7 per cent.; (2) *Ether extract*, unroasted peanuts 49.1 per cent., pecans 72.6 per cent.; (3) *Crude fiber*, English walnuts and pecans 2.1 per cent., filberts and unroasted peanuts 3.2 per cent.; (4) *Protein*, native walnut 9.6 per cent., roasted peanuts 27.8 per cent.;

(5) *Ash*, pecans 1.7 per cent., almonds 3.5 per cent.; (6) *Nitrogen-free extract*, hickory nuts 6.4 per cent., native walnuts 19.5 per cent.; (7) *Fuel value* (per pound), almonds 2803, pecans 3451.

M. T. BOGERT.

Valence Hypotheses and the Course of Chemical Reactions. BY ARTHUR MICHAEL. *J. prakt. Chem.* (2), **68**, 487–520.—Valence and the course of chemical reactions are referred to the relative energy of the atoms, and some of the recently introduced conceptions, particularly "Thiele's Partial Valence Hypothesis," are critically discussed. (The character of the article is such that it cannot be adequately reviewed here.) M. T. BOGERT.

On the Constitution of Phenylcinnamenylacrylic Acid Bibromide. BY ARTHUR MICHAEL AND VIRGIL L. LEIGHTON. *J. prakt. Chem.* (2), **68**, 521–534.—By the addition of bromine to phenylcinnamenylacrylic acid, Thiele and Rössner (*Ann. Chem.* (Liebig) **306**, 209) obtained a bibromide (m. p. 175°), in which they believed that the bromine atoms occupied positions 1 and 4 on the carbon chain. The authors of the present paper, however, contend that the reactions of the compound speak much more strongly for the 3,4 position of the bromines. EXPERIMENTAL PART.—The *Addition of Bromine to Phenylcinnamenylacrylic Acid* is best conducted in carbon bisulphide solution at 0°, and in direct sunlight. A pure bibromide is thus obtained, melting at 180°–181°. The mother-liquors from this bibromide contain an *isomer*, whose *methyl ester* melts at 133°–134°. Phenylcinnamenylacrylic acid was converted into its *methyl ester* (m. p. 82°–83), which was then dissolved in chloroform and treated with bromine in direct sunlight, giving the same bibrom ester (m. p. 118°) as obtained by Thiele and Rössner. By esterification of phenylcinnamenylacrylic acid bibromide (m. p. 181°) with methyl alcohol, the main product was the methyl ester of m. p. 118°, together with some of the isomer (m. p. 134°), while the mother-liquors contained an amorphous ester. By oxidizing the acid bibromide (m. p. 181°) in acetone solution with potassium permanganate, benzoic acid, benzoylformic acid, and a substance containing bromine were obtained. The oxidation of the methyl ester bibromide (m. p. 118°) yielded cinnamic acid bibromide, benzoylformic acid and benzoic acid. The isomeric solid methyl ester (m. p. 134°) and the liquid one, gave similar oxidation products. A solution of potassium hydroxide in methyl alcohol does not attack phenylcinnamenylacrylic acid bibromide at low temperatures (—15°); at ordinary temperatures, however, it changes it to either diphenyldihydrofurane or to a mixture of this with phenylbromcinnamenylacrylic acid, depending upon the amount of alkali present. The ethyl ester is less stable to alkali than the free acid, and even at low temperatures loses hydrobromic acid and gives the ethyl ester of phenylbromcinnamenylacrylic acid. By the action of methyl alcoholic alkali upon methyl ester bibromide (m. p. 134°), a phenylbromcinnamer acrylic methyl ester was obtained (m. p. 81°–82°) isomeric w that described by Thiele and Rössner (m. p. 128°). By treat the liquid mixture of acid bibromides with alcoholic alkal phenylcinnamenylacrylic acid (m. p. 200°–201°) was obtain isomeric with that of Thiele and Rössner, together with dipher dihydrofurane and a small amount of an acid, melting at 17 176°, which could not be prepared in the pure state.

M. T. BOGERT

A Basic Reaction of Aromatic and Fatty Aldehydes. SAMUEL S. SADTLER. *J. Franklin Inst.*, **157**, 231–234.—When aldehyde is heated with neutral sodium sulphite solution soluble dihydrosulphonate is formed together with caustic alk according to the following equation: $R.COH + 2Na_2SO_3 + 2H_2C$ $R.COH(NaHSO_3)_2 + 2NaOH$. By titrating with standard ac using rosolic acid as indicator, the amount of alkali liberated the reaction may be determined, and from this the percentage aldehyde calculated. In the case of essential oils, any acid res present must be neutralized before the addition of sodium s phite.

M. T. BOGERT

BIOLOGICAL CHEMISTRY.

Effect of Intravenous Infusion of Sodium Bicarbonate af Severe Hemorrhage. BY PERCY M. DAWSON. *Am. J. Physi* **10**, xxv–xxvi.—From the data obtained it is seen that solutions c taining sodium bicarbonate bring about an increase in card action, thereby restoring the blood pressures (systolic and dias lic) to a higher level than when sodium chloride alone is e ployed. When a solution containing 0.8 per cent. sodium ch ride and 0.25 per cent. sodium bicarbonate is infused slowly, beneficial action persists for a considerable time.

F. P. UNDERHILL

Ricin. BY T. B. OSBORNE AND L. B. MENDEL. *Am. Physiol.*, **10**, xxvi–xxvii.—Ricin, an albumin occurring in the c tor bean, in doses of 0.002 milligram per kilo, possesses enou toxic power to cause the death of rabbits when injected sub taneously. The post-mortem appearance of the tissues is v characteristic in every case. The ricin preparation also posses very marked agglutinating and sedimenting properties tow mammalian red corpuscles. The belief is advanced that the to action is due to the proteid itself and not to some non-prot body, a view that has lately been put forward.

F. P. UNDERHILL

Coefficients of Digestibility and Availability of the Nutrients of Food. BY W. O. ATWATER. *Am. J. Physiol.*, 10, xxx–xxxi. The proposed factors of availability of the nutrients of food compared with the actual availability in 411 experiments are; in per cent.:

	Protein.	Fat.	Carbohydrate.
Proposed factor	92.0	95.8	97.0
Actual factor	91.1	94.8	96.8

F. P. UNDERHILL.

The Influence of Hemorrhage on the Formation and Composition of Lymph. BY E. R. POSNER AND WILLIAM J. GIES. *Am. J. Physiol.*, 10, xxxi–xxxii.—The results of the experiments show a diminished flow of lymph from the thoracic duct. The injection of sodium chloride gave lymphagogic effects as great as those observed in a normal animal (dog). The same effect was noted after injection of leech extract. No regularity in the proportion of organic solids eliminated under these conditions has been observed, except after the injection of lymphagogics.

F. P. UNDERHILL.

Original Research Regarding Human Perspiration, Etc. BY JULIUS H. HOELSCHER. *N. Y. Med. J.*, 79, 296–300.—Among other results obtained it was found that 1000 cc. of sweat contains about 11 grams of solids, one-half inorganic and one-half organic; about 0.6 gram of urea and about 0.047 gram of nitrogen.

F. P. UNDERHILL.

Fluorescein in Transillumination of the Stomach. BY ROBERT COLEMAN KEMP. *N. Y. Med. J.*, 79, 303–305.—In this article fluoresceïn as a fluorescent medium is shown to give better results in the transillumination of the stomach than water.

F. P. UNDERHILL.

A Suggestion for the Rapid Calculation of Percentage Milk Mixtures: With Description of a Mechanical Device for the Instantaneous Calculation of Such Formulae. BY THOMPSON S. WESTCOTT. *N. Y. Med. J.*, 79, 257-259.—See orginal article for particulars. F. P. UNDERHILL.

On the Influence of Ether Anaesthesia. BY P. B. HAWK. *Am. J. Physiol.*, 10, xxxvii–xxxviii.—The following phases of the subject have been studied: glycosuria following ether anesthesia; changes in the blood produced by such anesthesia; and the influence of ether anesthesia upon urine flow, and the excretion of nitrogen and chlorine. The experimental animals (dogs) were brought into nitrogenous equilibrium and then subjected to either anesthesia for periods varying from thirty minutes to four and one-half hours. A slight diuresis invariably followed, which was accompanied by a slight increase in the output of nitrogen and a large increase in the elimination of chlorine. Glycosuria always occurred. In general, the changes noted in the blood after anesthesia were an increase in the number of red corpuscles, and a smaller increase in the number of lèucocytes; the hemoglobin was more irregular. In the course of a few hours, the red corpuscles became normal in number, whereas the leucocytes increased rapidly and produced an extensive leucocytosis in from three to five hours. Experiments made in a similar manner upon fasting dogs gave results very similar to those obtained with normal animals except that no glycosuria was produced.

F. P. UNDERHILL.

The End-Products of Self-Digestion of Animal Glands. BY P. A. LEVENE. *Am. J. Physiol.*, 10, xxxviii.—By the self-digestion of the pancreas and liver the author has succeeded in obtaining as end-products, alanin, amino-valerianic acid, leucin, glutamic and aspartic acids, tyrosin, and phenylalanin. The presence of α-pyrolidine-carbonic acid could not be established with certainty.

F. P. UNDERHILL.

The End-Products of Tryptic Digestion of Gelatine. BY P. A. LEVENE. *Am. J. Physiol.*, 10, xxxix.—The purpose of the experiments was to compare the composition of peptone with that of native proteid and with that of proteoses. It was found that the molecule of gelatose contained more glycocoll than that of gelatine. Gelatine peptone contained less glycocoll than gelatose. In order to explain these observations, the crystalline products of digestion were studied. There were found glycocoll (in very large quantities), leucin, glutamic acid (in smaller quantities), phenylalanin, and a substance of the composition of inactive pyrolidine-carbonic acid.

F. P. UNDERHILL.

The Simultaneous Action of Pilocarpine and Atropine on the Developing Embryos of the Sea-Urchin and Starfish.—A Contribution to the Study of the Antagonistic Action of Poisons. BY TORALD SOLLMANN. *Am. J. Physiol.*, 10, 352–362.—Small doses of pilocarpine hasten the development of the embryos. Larger doses, or a prolongation of the action, produce the opposite results. Small doses of atropine have no action. Larger doses hinder development. When both drugs are used, there may be antagonism or synergism, according to conditions; but the depressant action always tends to predominate. The observed resultant is always below the mathematical average. Even with the best antagonism, both poisons are producing their action, as shown by the greater liability of the protoplasm to depression. Stimulation can be readily and completely removed by very small doses of a depressant, even by doses which are inactive when used alone. Depression is lessened by only a limited range of doses of the stimulant. Its removal is in no case complete. This gives to stimulation a limited but distinct usefulness. The optimum dose of the stimulant is smaller when the embryos are depressed than when they are normal. Larger doses are synergistic to the depressant, and hence harmful. The dose of the stimulant must, therefore, be chosen smaller, when depression exists, than in normal specimens. F. P. UNDERHILL.

The Dietetic Value of Patented Foods. BY W. D. HALLIBURTON. *N. Y. Med. J.*, 79, 145–150.—A lecture delivered before the American Chemical Society in New York, January, 1904, in which the many fallacies concerning several varieties of patent foods are discussed. F. P. UNDERHILL.

Effect of Ions on the Decomposition of Hydrogen Peroxide, and the Hydrolysis of Butyric Ether by a Watery Extract of Pancreas. BY C. HUGH WILSON AND ORVILLE H. BROWN. *Am. J. Physiol.*, 10, 335–345.—There is a constant inhibition by the chlorides of the alkalies, alkaline earths and heavy metals used, on both the decomposition of hydrogen peroxide and the hydrolysis of butyric ether by pancreas extract. The depressing effect is much more marked in the first case than in the latter. The explanation of this may be that the hydrogen peroxide is readily soluble in the water and the salt used, while the butyric ether is less soluble. The contact of the catalytic agent in the extract with the salt and the hydrogen peroxide is better than where the butyric ether is used. There are differences in the action of certain salts on the decomposition of hydrogen peroxide and the hydrolysis of butyric ether, by a watery extract of the pancreas. The nitrate and chlorate of sodium inhibit strongly the decomposition of hydrogen peroxide, while they inhibit only moderately the hydrolysis of butyric ether. Sodium formate inhibits strongly in the first case, but accelerates slightly in the latter, while sodium salicylate acts in just the reverse manner. In general, the salt in an optimum concentration which accelerates in one case, does likewise in another. The results obtained can be explained on the assumption that, in general, in the decomposition of hydrogen peroxide and the hydrolysis of butyric ether by a watery extract of pancreas, the cations have a depressing or retarding action and the anions have an accelerating influence.
F. P. UNDERHILL.

Does An Antagonism Exist between Alkaloids and Salts? BY MARTIN H. FISCHER. *Am. J. Physiol.*, 10, 345–352.—The experimental animals employed in this investigation were frogs and rabbits. The alkaloid used was strychnine and the salts, calcium chloride, sodium citrate, magnesium and barium chlorides. The results obtained indicate that no antagonism exists between alkaloids and salts. F. P. UNDERHILL.

The Effect of Diuretics on the Urine, with a Diet Poor Salts. By H. D. Haskins. *Am. J. Physiol.*, **10**, 352. Sollmann has shown that the administration of diuretics causes increase of the urinary chlorides in rabbits whose urine has be rendered poor in these salts; with dogs no such effect was note The present investigation carried out upon man and along t same line, shows that diuretics have no influence on the exc tion of the chlorides although, in so far as the water and urea e cretion may be concerned, diuresis may be produced. The co clusion drawn is that the normal human kidney belongs to t resistant class. F. P. Underhill.

The Relation Between Solution Tension, Atomic Volum and the Physiological Action of the Elements. By Albert I Mathews. *Am. J. Physiol.*, **10**, 290–324.—The physiologic action (poisonous action) of any cation or metal upon Fundulu eggs and probably other forms of protoplasm varies inversel with the solution tension. These ions with a very low solutio tension are very poisonous; those with a high tension are relatively inert. The poisonous action of any anion is similarly a inverse function of the solution tension: oxygen, cyanogen oxalate, and iodine ions, with a low solution tension, being mor poisonous than chlorine with a high solution tension. Th poisonous action (physiological action) of any salt is, therefore a function of both ions, and varies inversely with the sum of th solution tensions of the ions; that is, with the decomposition tension of the salt. From the decomposition tension of two salts knowing the minimum fatal dose of one, the minimum fatal dos of any other may be calculated approximately by the followin formula:

$$V_a = \frac{V_o}{\frac{E_a - E_o}{20.14 + 0.03E_a}},$$

in which V_a is the dilution of the unknown minimum fatal dos of some salt, E_a is the decomposition tension of this salt, V_o is th known dilution of the minimum fatal dose of some salt, and E_o th decomposition tension of this salt. Certain exceptions to th foregoing statement are noted. There is an inverse relatio ship between atomic volume and poisonous action; and a dire relationship between equivalent weights and poisonous actio The results obtained indicate that the solution tension of any io becomes greater, and its physiological action consequently les the higher the solution tension of the opposite ion with which is associated. Thus all potassium salts were found less poiso ous than the corresponding sodium salts. The poisonous actio of potassium for special tissue, for example, muscle and nerve, possibly due to special conditions and must be further inves gated. F. P. Underhill.

On the Production of Contact Irritability Without the Precipitation of Calcium Salts. By W. D. Zoethout. *Am. J. Physiol.*, **10**, 324–335.—The chlorides of potassium, caesium, ammonium, rubidium and, perhaps, barium aid the development of contact irritability, although these salts themselves do not give rise to this form of irritability. The chlorides of sodium, lithium, magnesium, and calcium inhibit the genesis of contact irritability. In the normal muscle, only those salts of sodium that precipitate calcium can produce contact irritability. But if caesium or rubidium chloride are introduced into the muscle simultaneously with the acetate, succinate, or nitrate of sodium, contact irritability is established. This also holds true for the oxalate, citrate and sulphate of lithium and ammonium and to a slight extent for lithium acetate. The following salts do not cause contact irritability even with the aid of caesium or rubidium chloride: the bromide, iodide, and chloride of sodium and lithium, the nitrate of lithium and ammonium, the acetate of ammonium, and the sulphate and tartrate of magnesium.

F. P. Underhill.

A Study of the Variations in the Course of the Nitrogen, Sulphate, and Phosphate Excretion, as Observed in Short Periods Following a Small Increase in the Proteid Ingested. By P. B. Hawk and Joseph S. Chamberlain. *Am. J. Physiol.*, 10, 269–290.—The subjects of the experiments were two young men. The general plan of the investigation was to arrange a fixed diet during the continuance of which the nitrogen, sulphate and phosphate excretions were noted in periods of three hours. After the excretion of these substances had become regular an extra quantity of proteid was added to the diet and the nitrogen, sulphate and phosphate excretions again determined. The results show that the nitrogen excretion has two maxima daily, and the rate of sulphate elimination follows closely that of the nitrogen. The phosphates differed decidedly in their rate of excretion from either the nitrogen or the sulphates. After the ingestion of a small extra amount of proteid food, the rate of excretion of nitrogen reached its maximum within three to four and one-half hours, after which it fell to its normal rate. The sulphate excretion reached its maximum about six hours later than did the nitrogen elimination. In one subject the ratio of nitrogen to sulphates was lowest on the day of increased proteid ingestion; in the other, on the day after this ingestion. The maximum phosphate excretion due to increased proteid ingested fell in a period between those in which the maxima of nitrogen and sulphate occurred. The rate between the heat of combustion of the urine and its nitrogen content was lower on the day of increased proteid ingestion than on normal days.

F. P. Underhill.

Artificial Fluorescence of Living Tissue in Relation to Disease. By William James Morton. *N. Y. Med. J.*, 79, 300–303 and 79, 353–356.—The theory upon which these investigations have been carried out is to combine the properties possessed by radium and the X-rays, of penetrating the human tissues, with the facts of fluorescence of fluid solutions, and thus to establish a system by means of which the entire living organism may be flooded with a fluorescible solution used medicinally, and at the same time by directing the radium or X-rays upon a given organ or seat of disease, or upon the whole body, set up, at the desired areas within the tissues, the violet, ultra-violet and other rays. Carried out practically, very promising results have been obtained, especially in the treatment of carcinoma. F. P. Underhill.

Personal Experiences with the Administration of Nitrous Oxide and Oxygen for Prolonged Anaesthesia. By Prescott Le Breton. *N. Y. Med. J.*, 79, 292–296.—The main conclusion reached in this article is that the use of nitrous oxide and oxygen for prolonged anesthesia is satisfactory but limited.

F. P. Underhill.

The Occurrence of Zinc in Certain Invertebrates. By Harold C. Bradley. *Science*, 19, 196–197.—Zinc has been found as a normal constituent of the ash of the hepato-pancreas and blood of the carnivorous gastropod, *Sycotypus canaliculatus*, and was also present in less quantity in the ash of *Fulgus carica*. Iron and copper were also present. The form in which the zinc occurs has not yet been determined. The following other evasive forms have been examined for zinc with negative results: *Urosalpinx cinerea*, *Mytilus edulis*, *Modiola plicatula*, *Argina pexata*, *Eupagurus pollicaris*, *Ostrea virginiana*, and *Cancer irroratus*.

F. P. Underhill.

The Passage of Food Stuffs from the Stomach. By W. B. Cannon. *Am. J. Physiol.*, 10, xvii–xix.—These X-ray experiments upon cats tend to show that free acid in the stomach opens the pylorus, and when in the duodenum closes the pylorus. But acid in the duodenum stimulates alkaline secretions, and the acid is thereby neutralized; whereupon the acid in the stomach agains opens the pylorus to allow more food to pass out. Thus proteids would be retained in the stomach until acted upon by gastric juice, and thus automatically the intestine would be guarded from being overwhelmed with food and with secretions interfering with the intestinal ferments. F. P. Underhill.

The Emptying of the Human Stomach. By W. B. Cannon. *Am. J. Physiol.*, 10, xix.—Observations with the X-rays on a normal human stomach containing food mixed with bismuth subnitrite show that while digestion is proceeding, and the stomach

g itself, it shortens, just as if the longitudinal and
bres passing over the surfaces to the greater curvature
organ up toward the one fixed point of the contracting
cardia. Since the pylorus is also more or less fixed,
rise with the rest of the stomach. The consequence
the late stages of digestion, when the gastric contents
luid than in the earlier stages, the pylorus becomes the
int in the stomach, and the contents do not, therefore,
lifted in order to be passed out.

F. P. UNDERHILL.

bsence of a Cane-Sugar Inverting Enzyme in the Gas-
By GRAHAM LUSK. *Am. J. Physiol.*, 10, xxi–xxii.
iments prove, contrary to results reported by Widdi-
t no cane-sugar inverting enzyme exists in the gastric
nd confirm the belief that such inversion of cane-sugar
ace in the stomach is due to the presence of free hydro-
d.

F. P. UNDERHILL.

Method of Gastric Proteolysis. By A. L. BENEDICT.
ed. Sci., 107, 274–282.—This is a method for clinical
intended as a means of studying the motor activities of
h. The method is based upon a comparison of volumes
eral substances precipitated by their respective pre-

F. P. UNDERHILL.

Enzyme of the Thymus. By WALTER JONES. *Am.*
, 10, xxiv–xxv.—The experiments herein reported show
exists in the thymus gland an enzyme capable of decom-
nucleoproteids of the gland into the xanthine bases and
acid.

F. P. UNDERHILL.

nzyme of the Suprarenal Gland. By WALTER JONES.
ysiol., 10, xxv.—It is shown that the suprarenal gland
n enzyme that is capable of breaking down nucleo-
to the xanthine bases and phosphoric acid.

F. P. UNDERHILL.

ents on the Precursors of Urinary Indican. By
UNDERHILL. *Am. J. Physiol.*, 10, xxii.—The experi-
l to show that the presence of indican in the urine owes
to the activity of bacteria in the intestines. Since
has been regarded as a precursor of indol, substances
no tryptophan group, notably gelatin, have been fed
the purpose of determining whether indican would be
he urine. The results show that when gelatin is fed in
ntities there is a marked decrease of indican in the

F. P. UNDERHILL.

ysical Factors Concerned in Urine Formation. By To-
MANN AND R. A. HATCHER. *Am. J. Physiol.*, 10, xxv–

xxvii.—Upon determining the excretion of chlorides by ex and perfused kidneys it was observed that if saline solution perfused, the chloride-content of the perfusing fluid and o ureter filtrate are identical. If mixtures of defibrinated blooc sodium sulphate are circulated, the ureter filtrate contains al as much chlorides as the serum. The slight retention whic curs is different in kind as well as in degree from the rete which occurs in the living animal. This "living retention' been lost. This is not due to changes in the chlorides o serum produced in defibrination; for defibrination has no (on the chloride retention of living animals. It must be due t jury to the kidney produced by very brief interruption o renal circulation.

The changes occurring in the kidney during perfusion w per cent. sodium chloride under uniform conditions are show be mechanical. The influences of the injection pressure, effects of compressing the renal vein, of occluding the ur and the concentration of the injection fluid are also studiec gether with changes observed after the injection of isotonic tions, and various other substances. F. P. UNDERHI

The Influence of Hemorrhage on Proteid Catabolism. P. B. HAWK AND WILLIAM J. GIES. *Am. J. Physiol.*, **10**, xx xxix.—The results of the research show that hemorrhages of a 3 per cent. of the body caused among other effects, dimini secretion and decreased specific gravity of the urine at first, reverse after twenty-four to forty-eight hours; a slight tempc increase in the amount of nitrogen and sulphur in the urine, a decrease in the quantity of excreted phosphorus. Rep hemorrhages from the same animal resulted in cumulative q titative catabolic effects in harmony with those after single l of about 3 per cent. of body-weight; a steady decline of b weight; gradual increase in daily volume of urine; nitroge equilibrium seemed to be repeatedly established in a few after each hemorrhage, on successively lower planes, by original amount of food. F. P. UNDERHI

Nitrogenous Metabolism After Splenectomy. BY LAFAY B. MENDEL AND R. B. GIBSON. *Am. J. Physiol.*, **10**, xxix–xx The experiments were carried out upon a human subject anc chief points of interest presented are: The normal charact the curves of post prandial hourly excretion of uric aci other nitrogenous constituents of the urine; the retention of rides during febrile conditions; the undiminished capacity o organism to form uric acid from its precursors (purin bodi the food); the relatively large output of uric acid of "en nous" origin on a purin-free diet; and the pronounced eli tion of urobilin at times. F. P. UNDERHI

PHARMACEUTICAL CHEMISTRY.

Artificial Camphor. By A. F. Collins. *Merck's Rep.*, 13, 42.—About a ton of oil of turpentine is introduced into a steam-jacketed tank to which anhydrous oxalic acid is added, yielding at the end of the reaction pinyl oxalate and pinyl formate. The liquid is distilled with steam in the presence of an alkali whereby ordinary camphor is obtained from the pinyl oxalate, and borneol camphor, which is an alcohol formed by the reduction of camphor, from the pinyl formate. This crude product is forced through a filter-press to free it from all traces of oil. The purified mixture of camphor and borneol is transferred to an oxidizing tank where the borneol is oxidized to ordinary camphor. The latter is separated from the oxidizing solution by means of a centrifuge and is finally sublimed.

Oil of turpentine thus treated yields from 25 to 30 per cent. of its weight as camphor. The process requires about fifteen hours. Of the camphor consumed in this country, about one-fourth is used in medicine and the remainder in the arts, large quantities being used in the manufacture of artificial leather, celluloid, guncotton and photo films. W. H. Blome.

Detection of Acetanilide When Mixed with Phenacetin. By Elton Fulmer. *Merck's Rep.*, 13, 35.—Upon treating a diluted hydrochloric acid solution of acetanilide and of phenacetin with a diluted solution of chromic acid, a red color is produced with phenacetin, and a yellow color, which rapidly changes to yellowish-green and finally to green, is produced with acetanilide. In spite of the fact that other workers have discarded this test as worthless, it is possible to detect as little as 0.25 per cent. of acetanilide when mixed with phenacetin. The test is applied thus: 0.1 gram of the substance is boiled for one minute with 1 cc. of concentrated hydrochloric acid, then diluted with 10 cc. of water and filtered. Three drops of a 3 per cent. solution of chromic acid are added to the filtrate. Pure phenacetin gives a permanent ruby-red color, while pure acetanilide gives at first a pure yellow, changing rapidly to a greenish-yellow, then to a dark green color, and finally, after standing, a green flocculent precipitate separates out. By comparing the bulk of the precipitate obtained with that from a known weight of acetanilide, the amount of the latter in a mixture may be approximately estimated.

W. H. Blome.

The Tests for Phenacetin and Acetanilide. By Geo. M. Beringer. *The Drug. Circ. and Chem. Gaz.*, 47, 184.—A number of mixtures of phenacetin and acetanilide in varying proportions were made up and their melting-points determined. While pure phenacetin melts completely between 134.5°C. and 135°C., and acetanilide at about 113°C., the melting point of the mixtures was always found to be lower than that of phenacetin, and in many proportions even lower than that of acetanilide. The melting point of a mixture is not sharp, extending over several degrees. Some of the tests given in various texts as being distinctive for these substances are in reality not reliable.

Valuable tests are Hirschsohn's bromine water test, by means of which 5 per cent. and, with careful work, 2 per cent. or even 1 per cent. of acetanilide may be detected in phenacetin. The author gives three methods of his own, which are at the same time simple and accurate. One of these depends upon the decomposition of acetanilide by means of sodium peroxide, and the ability of the resulting compound to react with sodium hypochlorite solution. If the phenacetin is pure, the liquid remains colorless, and even after long standing becomes no more than pale yellow, while the layer floating on top is not colored. When acetanilide is thus tested it gives a purple-red to brown-red solution, while the floating upper layer assumes the same color. After some experience, as little as 1 per cent. of acetanilide may be detected in mixture with phenacetin. When sugar, salicylic acid, salophen or sodium bicarbonate are used as adulterants, this test is scarcely applicable on account of the violence of the reaction.

W. H. BLOME.

Cocoa: Its Production and Use. BY WM. B. MARSHALL. *Am. J. Pharm.*, **76**, 55.—Of the beverages most commonly used, coffee, tea and cocoa, the latter is the most nourishing. The most important of the cocoa producing trees cultivated is the *Theobroma cacao.* The small flowers appear in clusters all along the larger parts of the tree, extending down the trunk almost to the ground. The fruits are from six to ten inches long, from four to six inches in diameter, and weigh several pounds. These contain from 20 to 40 seeds, which, after curing, become the commercial cocoa beans. The average annual yield per tree is about 36 fruits or 3 pounds of beans. A day or two after the fruits have been gathered they are cut open and the pulp in which the seeds are embedded is removed. The beans are packed in barrels and boxes, covered with banana leaves, and allowed to ferment for three or four days. After cleaning and drying, the beans are sorted by hand, put into bags and are ready for market.

The method of making cocoa and chocolate on a commercial scale is very simple, consisting briefly of roasting, crushing and removing the outer shell, the husk and the hard radicle, grinding to a smooth paste and finally cooling, This gives cocoa. Chocolate is made from this by adding flavoring and sugar.

In passing through the heated grinding machines the mass becomes fluid and a large part of the oil oozes from the machine. This is collected in large pans, where it hardens on cooling. After refining, this constitutes the cocoa butter, which is used in the manufacture of cream confections, fine soaps, suppositories, ointments, cosmetics, and, as it is a nutritious food, it is sometimes used as a substitute for cod liver oil. W. H. BLOME.

Some Rare Fixed Oils. BY G. R. PANCOAST AND WILLARD GRAHAM. *Am. J. Pharm.*, **76**, 70.—A classification of certain rare fixed oils for which there is some, though rather limited, demand in commercial circles; also a table of their specific gravities and saponification numbers. W. H. BLOME.

Examination of Commercial Peppers. BY J. W. GLADHILL. *Am. J. Pharm.*, **76**, 71.—After examining thirteen different kinds of peppers, the following conclusions were arrived at: The ash should not exceed 6.5 per cent. for black, nor 3 per cent. for white pepper. The residue from an ether extract should be from 7.5 per cent. to 10 per cent. for black, and from 6 per cent. to 9 per cent. for white pepper. Black pepper containing less than 5.5 per cent. of piperine is not to be considered a good pepper. Good black pepper should contain from 5.5 per cent. to 9 per cent. of this constituent. Hulls and cocoanut shells were found to be used as adulterants. These increase the per cent. of ash, and decrease that of the ether extract, piperine and oleoresin. For the identification of less than 10 per cent. of these adulterants we must depend upon the microscope. W. H. BLOME.

Lime Water. BY M. I. WILBERT. *Am. J. Pharm.*, **76**, 66.—Commercial samples of lime water upon examination were found to contain from 0.043 per cent. to 0.165 per cent. of calcium hydroxide, whereas the pharmacopoeia requires that it contain about 0.148 per cent. of this constituent. They also contained soluble sulphates and chlorides, and were generally made with city water instead of distilled water. It seems advisable that some changes be made in the pharmacopoeial requirements, and the following are suggested: Increase the amount of lime to 1 part for every 25 or 30 parts of solvent, and allow the use of successive quantities of water upon the undissolved calcium hydroxide; before dispensing, to filter the lime water, discarding the first filtrate; to use freshly calcined lime, or such as has been carefully protected against the atmosphere and is free from carbonate; and finally, to indicate minimum and maximum content of calcium hydroxide.
W. H. BLOME.

History of Echinacea Augustifolia. BY JOHN URI LLOYD. *Am. J. Pharm.*, **76**, 15.—Since 1869, Dr. H. C. F. Meyers, of Pawnee City, Neb., has prepared a secret remedy which he has recommended empirically for all diseases dependent upon depraved blood. Upon his request, in order to introduce the drug more extensively into medical practice, Professor Lloyd made up several liquid preparations which were sent out to a number of practicing physicians good standing. According to the reports of these men, the dr appears to have accomplished all that was claimed for it and sphere of action was extended from the eclectic to other scho of medicine. Instances are given of the curative effects of t drug in cases of bites of poisonous snakes, and of its palliati effects on one patient suffering from cancer.

Echinacea angustifolia, commonly known as "nigger head grows abundantly in Kansas, Oklahoma, Nebraska, and in oth parts of the West and Southwest. Commercial samples n contain large amounts of *Echinacea purpureum*, "black Sam son," and of *Eryngium aquaticum*. The root of *Echinacea* brown or brownish red, longitudinally wrinkled, and its shrunk epidermis sometimes twists spirally about the root. Wh broken, the break always has the appearance of having been fected with dry rot. Upon chewing the root, a peculiar tingli is experienced, reminding one of aconite, but is devoid of t numbing effect of the latter. It contains a very small amount a colorless alkaloid, much sugar and coloring matter, and l than one-half per cent. of an organic substance of acid reacti having an intensely acrid taste, upon which the virtues of t drug depend. W. H. BLOME

Gardens of Medicinal Plants. BY ALBERT SCHNEIDER. *Am Pharm.*, 76, 19.—An exhaustive history and description of gard in which medicinal plants are grown, their purposes, a suggesti as to what plants may be grown to advantage, and finally the i portance of a method of grouping plants in such gardens.

W. H. BLOME

The Citral Assay of Volatile Oils. BY E. KREMERS AND W. BRANDEL. *Pharm. Rev.*, 22, 72.—Burgess and Child emp a modification of the sodium bisulphite method, and claim to able to obtain results varying within 0.2 per cent.

Tiemann has shown that a neutral solution of sodium sulphi when shaken with citral, yields a sodium salt of the sulpho acid and an equivalent amount of sodium hydroxide. Sadt has worked out a method for the assay of citral, depending u the titration of the sodium hydroxide formed, by N/2 hydrochl acid. Multiplying the number of cubic centimeters of the lat used by a factor, gives the amount of citral present. In the ha of the authors the method gave good results.

Garnett reduced citral to geraniol by means of metallic sodi and glacial acetic acid. This product was acetylated by Lieb mann's method and then saponified with alcoholic potash. T citronellal enters into the reaction upon acetylization, limon may also react, both of which would influence final results a make the accuracy of the method doubtful.

With cyanacetic acid, citral yields a crystalline citralidene cy acetic acid, and this fact has been made use of as the basis of an assay method. The oil is concentrated and mixed with the acid in a soda solution. The aldehydes dissolve in the alkaline liquid, while the non-aldehyde portion floats on the top, which latter quantity may be read off directly in cubic centimeters from the graduations of the flask, and this number subtracted from the number of cubic centimeters of oil operated upon. The results are uniformly slightly too high.

Several investigators have tried to make use of citraloxime for the assay of citral in oil of lemon. While some claim to obtain results varying between 0.2 per cent., others have pronounced it impracticable.
W. H. Blome.

Tincture of Iodine. By E. H. Gane. *Am. Drug. and Pharm. Rec.*, **44**, 39.—Tincture of iodine is liable to undergo a number of changes on being kept for some time. It becomes more soluble in water, weaker so far as free iodine is concerned, and there are formed at the expense of the iodine, hydriodic acid, which, acting upon the alcohol, yields ethyl iodide, aldehyde and iodoform. Even a tincture made with the greatest of care from resublimed iodine and pure ethyl alcohol, will in time suffer a loss of free iodine. Hydriodic acid has been found in the tincture to the extent of from 0.1 to 2 per cent., according to the age of the preparation. Keeping the tincture in the dark avails nothing.
W. H. Blome.

Alkaloidal Color Tests with Those of Strychnine as Examples. By L. F. Kebler. *Merck's Rep.*, **13**, 12.—The various methods of extracting and purifying alkaloids from associated matter are given at some length and their defects pointed out. It is quite difficult to entirely purify an extracted alkaloid, especially when present in very small amount. This being true, too much reliance must not be placed upon the colors produced by many chemical reagents, since the small amounts of impurity may lead to erroneous conclusions. Color changes do not appeal to all alike, because of defective vision or color-blindness. In cases of great moment, as in toxicological examinations, the microscope and physiological tests should always be called into use.
W. H. Blome.

SANITARY CHEMISTRY.

Sewage Disposal in Iowa. By A. Marston. *Journal Western Society of Engineers*, **8**, 638–675.—This paper gives an account with drawings and half tones of all the sewage purification plants in Iowa, which, including one under construction at Fort Des Moines, now number eleven. The detailed account of these plants is interesting, as they are all modern bacterial plants using the septic tank.

Ames.—The first sewage purification plant to be constructed i Iowa was at Iowa State College, at Ames, in 1898, consisting c a septic tank and two intermittent sand filtration beds. Septi tank, 22 feet by 54 feet, by 4 feet deep, brick walls, wooden covei 23,500 gallons capacity, equal to one-half the daily sewage flow A compartment containing about 3,500 gallons is partitioned o at the inlet end for a sediment chamber and is emptied at interval of six weeks. About four or five loads of dry sludge are obtaine at each cleaning, which is used as fertilizer on the college farm The two intermittent sand filtration beds are 55 feet by 150 feel by 4 feet deep, and the sewage from the septic tank is supplie automatically by a Miller siphon in doses of about 22,500 gallon: The plant is successfully operated summer and winter, as is show by detailed chemical and bacterial analyses. See this Journal R 26, 117. The plant cost only $2,500, but could not be duplicate for less than $3,500 to $4,000.

Marshalltown.—Marshalltown has a population of 11,500, an at the time the plant was designed the total volume of sewage wa 1,500,000 to 2,000,000 gallons, of which 1,000,000 to 1,500,000 wa from a glucose works, the poluting substances being mainly pai ticles of starch and gluten. The plant constructed to treat thi sewage consisted of three septic tanks side by side, each 170 fee long by 75 feet 5 inches at the water line, total capacity about tw million gallons, and of 12 cinder contact beds, each 200 feet b 55 feet by 3 feet, arranged in two series so that they can be use for double or single contact beds. Unfortunately for those intei ested in the treatment of glucose waste, the glucose factory sh down just as the sewage plant was completed, and the plant ha never been used. The total cost of plant was about $50,000.

Spirit Lake.—The plant at Spirit Lake, for a population of 121 was constructed in 1901, and is very similar to the Iowa Stat College plant. The septic tank is 45 feet by 45 feet by 4 fee brick walls, wooden cover, and containing about 40,000 gallor in its three compartments, one of these compartments containin 20,000 gallons serves as a dosing chamber and discharges aut matically when full by means of an 8-inch Miller siphon upon th surface of two sand intermittent filtration beds, 100 feet by 5 feet by 3 feet 6 inches. Plant cost $3,000. The sewage is chiefl from a butter renovating factory, the poluting material bein chiefly casein, and contains 7,000 to 12,000 parts of solid matte per million parts. The plant, according to the author, has nc been properly operated, although the contamination of the lake i prevented. Little nitrification has as yet been established, fre ammonia is left in the effluent, though the amount of oxygen co sumed is extraordinarily high. The effluent is not clear and ha an odor. The city has not attempted to use the plant in past wi ters, but agrees to this winter.

Marion.—At Marion, population 4,102, the original design was first to pass the sewage through a closed septic tank and then through cinder contact filters. The filters have never been built. The tank is 62 feet 9 inches long, 37 feet 3 inches wide and contains sewage to a depth of 8 feet. The top is arched over with concrete masonry resting on brick piers and arches, and is covered with earth, capacity 140,000, cost $5000-$6000. The tank works satisfactorily. There is no noticeable odor. The effluent, though not perfectly clear nor entirely free from odor, produces no visible pollution in the small stream into which it is discharged.

Grinell.—At Grinell, population 3,860, on account of the favorable experience at Marion, it was decided to build at first only a septic tank. The tank is of concrete with wooden cover, divided into three compartments, outside dimensions 51 feet by 134 feet, the depth of sewage is 6 feet, capacity of tank 252,000 gallons, cost $6,760. The tank was put in operation in December, 1902. Very little sediment has as yet been deposited and a scum has formed only over a part of the surface and there is practically no odor about the tank. When the tank was first put in operation the flow of sewage was about 400,000 gallons a day, which continued till July when it decreased to 100,000. With the larger volume, the effluent, though not quite clear, had little odor and created no nuisance when discharged into a creek, although it probably equalled or exceeded in volume the flow of the creek. With the sudden drop to 100,000 gallons of sewage, the results were not nearly so good. One compartment of the tank was then shut off leaving a tank capacity of about 140,000 gallons and the sewage increased to 180,000 gallons per day. Under these conditions the effluent improved but did not equal that obtained when the sewage equalled 400,000 gallons. The increase and decrease in amount is due to drainage of ground-water into the sewers.

Soldiers' Home. Industrial School. Insane Hospital.—The purification plants at the Soldiers' Orphans' Home, Davenport, population 485, at the Industrial School for girls, Mitchellville, population 200, and at Iowa Insane Hospital, Mt. Pleasant, population about 1,065, were all built by the Cameron Septic Tank Co., of Chicago, for the Iowa Board of Control of State Institutions. They consist of closed concrete septic tanks, and cinder contact beds, single contact being used. The regular Cameron Automatic Alternating Gear is employed. The contract price for the plants of these three institutions was respectively $4,450, $2,625 and $7,250. As to the action of these plants a statement secured from the State Board of Control is given, according to which, the working of these plants has not as yet been wholly satisfactory, due, they are inclined to think to cinders from Iowa coal not being the proper filling material for contact beds. Mr. Wyllie of the tank company gives as a reason the difficulty of treating the sewage of public institutions, it being f and stronger than ordinary sewage, containing more soap a and being more liable to trouble from disinfectants used i institutions.

Rockwell City, Clinton.—The plants at Rockwell City, p tion 1,222, and a private plant at Clinton, are small septic said to work successfully.

Fort Des Moines.—The plant which is now under constr is guaranteed to give a high degree of purification when for a garrison of 1,200 men. It consists of a closed septic t about 71,000 gallons capacity, divided into compartme dosing chamber of 10,000 gallons capacity, and 6 contact arranged on two levels for double contact, each containing square feet, and a sand filter 30 feet by 170 feet. At 75 g per capita, or 90,000 gallons for 1,200 men, the rate of filt on the contact beds will be 1,810,000 gallons per acre per d the sand bed 770,000 gallons. Contract price of plant $20,

LEONARD P. KINNIC

Comparative Statistics of Some Great Typhoid Epidem Recent Years. BY GEO. A. SOPER. *Eng. News*, 51, 64–65 (—In the *Eng. News*, 50, 574–577 (1903), this Journal R, 2 the author, after giving an account of the Butler, Pa., epic gave data regarding three other severe typhoid epidemics. present article these data are supplemented by citations of typhoid epidemics caused by infected water, and some war epidemics, where the fever was caused, not so much by the supply as by transmission by so-called secondary infection. two lists, when tabulated, give the following table :

Year.	Place.	Population.	Cases.	Deaths.
1879.	Caterham, Eng	5,800	352	21
1885.	Plymouth, Pa	8,000	1,104	114
1889–90.	Lowell, Mass	77,696	858	65
1890–91.	Lowell, Mass	77,696	1,907	132
1889–90.	Lawrence, Mass	44,654	693	53
1890–91.	Lawrence, Mass	44,654	1,099	89
1890–91.	Tees River Valley, Eng.	251,976	1,330	100
1893–94.	Grand Forks, Neb	6,000	1,245	96
1897.	Maidstone, Eng	33,830	1,928	150
1902.	Worthing, Eng	16,606	1,411	68
1903.	Ithaca, N. Y	13,000	1,300	78
1903.	*Butler, Pa*[1]	18,000	1,270	56
	U.S. Camps, Spanish war	107,973	20,788	1,570
	One camp at Jacksonville, Fla	18,749	3,417	260
	U. S. Camp, Civil War, Atlantic region	466,000	29,666	7,002
	South African War	250,000	50–60,000	8,000

Dr. Soper, in referring to the epidemic at Grand Forks, re

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[1] To December 17th.

in *Eng. News*, May 23, 1895, states that there is no absolutely authentic record of cases and deaths, and further that the distance by river from Grand Forks to Crookston, the supposed source of the epidemic, is given by Mr. Russell, City Engineer of Grand Forks, as 60 miles, and by the State Board of Health as 26 miles, the latter distance Dr. Soper believes to be more nearly correct. The real distance between the two places should be authoritatively stated, as it is an important data as evidence of how far infection by typhoid bacilli can be carried by water.

LEONARD P. KINNICUTT.

Filters Versus Contact Beds in Sewage Purification. BY W. S. SHIELDS. *Municipal Engineer*, **26**, 111–117.—The author first takes under consideration the septic tank, and agrees that it is now almost universally admitted to be essential in the present practice of bacterial purification, although consideration must be shown to the statements of such men as Douglas Archibald, of England, who still believes in chemical precipitation, especially for large plants, as a preliminary treatment to filtration. The English practice regarding septic tanks is to build them with a capacity of from one to one and a half times the daily flow and to expect the effluent to contain less than one part of albuminoid ammonia per million parts. The American practice is to design tanks only for one-half to one times the daily flow. The treatment of the septic tank effluent is the most interesting feature in the present state of the science. In some cases where sufficient running water is available it may be run into a stream, where the purification is completed under aërobic conditions.

As a rule, artificial means must be adopted, and these at present are sand filters, contact beds or percolating filters.

Contact beds are losing their popularity, and at the last meeting of the Sanitary Institute at Birmingham, England, the majority of speakers spoke against the adoption of this method of treatment. At the present time English practice is tending decidedly towards percolating filters. The author's own opinion is that contact beds are far from satisfactory, and he much prefers sand filters working intermittently and automatically.

The author also gives a full description of the sewage plant of the Allis Chalmers Company, an account of which plant has already been given in this Journal R., **26**, 116. The plant, according to Mr. Shields, has been in continuous operation for one year, giving entire satisfaction. LEONARD P. KINNICUTT.

Rural Water Supply. BY C. D. HOWARD. *W. Va. Agr. Expt. Sta. Bull. No.* **89**, pp. 163-213.—Analyses of spring, well, and river waters from the neighborhood of Morgantown, W. Va., are reported and the importance and means of securing a pure water supply are discussed. H. W. LAWSON.

Poison in Water from a Gold and Silver Mill. By P. A. Yoder. *Utah Agr. Expt. Sta. Bull. No.* 81, pp. 199–202.—Water from the tail race of a gold and silver mill showed the presence of 35 parts of lead, 5.1 parts of copper, and 166.6 parts of arsenic trioxide per 100,000 parts of water. This water, which was supposed to have caused the death of a number of cattle, "was so highly charged with arsenic that an ordinary drink for man or beast would contain sufficient to kill." H. W. Lawson.

INDUSTRIAL CHEMISTRY.

Utilization of Sulphur in Gas Works: Old and New Methods. (*Am. Gas Light J.*, February 1, 1904).—The suggestions given to manufacturers of gas (and it may also be applied to oil refiners) to save the sulphur, often evolved as hydrogen sulphide, are briefly: To burn the hydrogen sulphide gas with air and niter to make sulphuric acid in lead chambers; To make acid by means of platinized material; To partially burn the hydrogen sulphide in Claus kilns according to the following reaction:

$$2H_2S + SO_2 = 3S + 2H_2O.$$

To burn the hydrogen sulphide with the waste gases of the ammonia plant, and (a method which might be experimentally worked out) to burn the hydrogen sulphide in the presence of air and ammonia gas, the ammonium sulphite formed, it is claimed, being easily converted into ammonium sulphate.

S. P. Sadtler.

A New Charcoal Retort Plant. By Ernst Sjöstedt, Sault St. Marie, Ont. *Iron Age*, January 28, 1904, p. 16.—The retort ovens lately adopted by the Algoma Steel Company are constructed and operated as follows:

They consist of horizontal steel shells, 46 feet long, 6 feet 3 inches wide, and 8 feet 4 inches high, made of $^3/_8$ inch plate and provided with a double set of air-tight doors at each end. The wood is run in on four iron cars on standard guage tracks. Each car holds two cords of wood, supported by a skeleton that holds both the wood and the charcoal in place. A set of twenty retorts are installed, set up in brick walls like steam boilers, with a separate fire place and stack for each retort.

There are two cooling ovens for each retort into which the cars are run in turn, after intervals of twenty-four hours. The carbonizing itself taking 18 to 20 hours. From the second cooler the cars are run at once to the blast-furnaces or to railroad cars for shipment. Hand labor is at a minimum. The by-products of crude alcohol and pyroligneous acid are saved and the maximum of charcoal is obtained. The non-condensible gas is used for firing retorts and steam boilers.

A comparative table of different methods employed in America shows the advantage of this large scale work.

Methods.	Charcoal bushels.	Wood alcohol. Gallons.	Gray acetate. Pounds.	Turps. Gallons.	Tar. Gallons.	Values per cord wood.
In kilns without recovery of by-products	43–45	nil	nil	nil	nil	$2.64
In meilers (coaling under dust)	33.35	nil	nil	nil	nil	$2.04
In kilns, with mixed hard wood	43–45	2–2½	50–100	..	3	$4.04
In kilns with Southern pine	43–45	1	50–75	5	5	$4.98
In retorts with mixed hard wood	50–52	8–12	150–200	..	5	$7.65
In retorts with Southern pine	50–52	1½–2	120.	10	10	$7.37

S. P. SADTLER.

The Solvent Process of Degreasing Wool. *Scientific American Supplement*, February 13, 1904.—Compressed gas is used instead of air for moving the solvent through the wool, to press out the solvent and blow out the excess of solvent that has not been removed by pressure and also to heat the wool and to provide a safe atmosphere for the whole operation. The solvents that may be used are petroleum-benzine, carbon disulphide and carbon tetrachloride. S. P. SADTLER.

The Portland Cement Works. *Scientific American Supplement*, January 30, 1904.—The plant consists of six groups of buildings: 1. Crushing; 2. Weighing and Mixing; 3. Grinding; 4. Burning or Calcining; 5. Clinker Grinding and Cement Storing; 6. Coal Pulverizing.

The first two groups have a capacity of 10,000 barrels a day. The others have a capacity of 5,000 barrels. The limestone and cement rock are quarried close together. The broken rock is brought in flat cars to the works, where they are hauled, three at a time, to the top of the crusher house. They are here unloaded by mechanical means, operated by electric motors, and the rock goes through a series of crushers at different levels. The first pair of rolls weigh 25 tons each and can crush rocks weighing 5 tons. The rock is finally reduced to one-half inch size.

The crushing plant is driven by a 500-horse-power Allis cross compound, condensing engine. A 100-kilowatt generator for the motors of this department is also run by this engine.

After drying by falling through hot gases, a 24-inch belt conveyer carries the crushed rock back to the stock bins.

From these the limestone and rock are carried by conveyers to the upper part of the weighing house, where it is received in bins of 60 tons capacity. Below these bins are 10-ton weighing bins to receive the proper proportions of both ingredients, determined by analysis.

The material then passes by a 36-inch conveyer to the grinding houses where it is ground finer, the light dust being taken off by blowers. The fine grinding rolls, designed by Mr. Edison, are 28 inches in diameter. One roll is driven from the main shaft and two others by friction upon the first, maintained by five-eighths inch steel wire cables carried continuously around sheaves, mounted loosely on the ends of the rollers. Eighty-five per cent. of this ground material passes through a 200-linear mesh sieve, the remainder being carried back to the grinders. The fine material is separated by a blast aided by baffle plates. A screw carries the ground material to a belt that runs to the kiln house.

Only two kilns are installed at present, but provision is made for fourteen more. The kilns are of cast-iron, 150 feet long and 8 to 9 feet exterior diameter. The pitch of these rotaries is 0.32 inch per foot. The output of each kiln is about 750 barrels per day. Pulverized soft coal is used as fuel, forced in by compressed air. The amount of fuel is less than 80 pounds per barrel of product. The feed is regulated by friction-driven screw conveyers of small size.

A rotary cooler is provided to receive the clinkers and the air that is admitted to the kiln is drawn through the cooler. A bucket conveyer receives the still hot clinker and passes under perforated water pipes to complete the cooling. The rolls for crushing the clinker are similar to the rock crushing rolls.

The soft coal which is used is broken up in a "grizzly," and dried like the original rock. It is pulverized in ball mills.

S. P. SADTLER.

Recent Improvement in the Dry Cells of the Leclanche Type. BY ADOLPH J. MARSCHALL. *Electrochemical Industry*, February, 1904, p. 63.—The principal reaction in the well-known Leclanche type of cell is given as follows:

$$2NH_4Cl + 2MnO_2 + Zn = ZnCl_2 + 2NH_3 + H_2O + Mn_2O_3.$$

There are various side reactions, however, and among them are the action of ammonia on the zinc and of the zinc chloride formed by the normal action of the cell going to the bottom, and causing local action by the formation of a couple of zinc in ammonium chloride zinc and zinc in zinc chloride, which is easily understood. The latter difficulty is said to be reduced by adding zinc chloride to the composition. With regard to preventing trouble due to ammonia, the author uses only a small amount of ammonium chloride, say 3 per cent., the rest being zinc chloride. The ammonium chloride in this case probably acting as a carrier of ammonia, ammonium chloride being reformed by the action of ammonium hydroxide on zinc chloride. S. P. SADTLER.

Notes on the Effect of Tannin on Clay. BY HEINRICH RIES. *U. S. Geol. Survey*: advance extract from *Statistics of the Working Industries in the United States in 1902* (in *Mineral Resources of the U. S.* for 1902).—Repeating and following up some preliminary work of E. G. Acheson, the author has experimented with a number of clays, each deficient in some physical property, using the tannins, gallotannic acid and catechu as "modifiers." The amount of water required to produce a mass sufficiently plastic for molding, or even a slip, was in all cases reduced quite markedly. Both air shrinkage and total shrinkage on drying and burning were reduced. Most striking was the increase of tensile strength produced in the "green" clay. In some cases air-cracking was diminished. In both "green" and burned clays the hardness was increased. The plastic feeling of most of the clays seemed to be increased. Microscopical examination seemed to show that the effect of tannins on the structure was to deflocculate the clay particles, or to break up the compound grains formed by the cohesion of a number of small particles. Valuable possibilities in the application of the above facts are suggested in the manufacture of earthenware, since it might be permitted to reduce or do away with the ball clay used in such mixtures. Confirmatory experiments are described. Straw emulsion, though containing no tannin, was found to produce results similar to those above described. W. F. HILLEBRAND.

AGRICULTURAL CHEMISTRY.

Wheats and Flours of Aroostook County. BY C. D. WOODS AND L. H. MERRILL. *Me. Agr. Expt. Sta. Bull. No.* 97, pp. 145–180.—The average composition of 8 samples of flour from Maine grown wheat was as follows: Water 13.50, nitrogen 1.60, fat 1.13, crude fiber 0.24, nitrogen-free extract 75.52, and ash 0.49 per cent. The average composition of 6 samples of Western flour was as follows: Water 11.96, nitrogen 2.09, fat 1.42, crude fiber 0.32, nitrogen-free extract 73.88, and ash 0.50 per cent. Calculating the results to a water-free basis, and estimating protein as N × 5.7, the Maine flours showed 3.02 per cent. less protein, 0.31 per cent. less fat, and 3.43 per cent. more nitrogen-free extract than the Western flours. Baking tests are reported, and the effects of climate and other factors upon the composition of wheat are discussed. Sixteen samples of Maine grown wheat showed the following average composition: Water 10.56, nitrogen 1.91, fat 2.29, crude fiber 2.41, nitrogen-free extract 72.02, and ash 1.81 per cent. The average composition of 12 samples grown in the Northwest was as follows: Water 11.31, nitrogen 2.26, fat 2.24, crude fiber 2.45, nitrogen-free extract 69.16, and ash 1.96 per cent. Analyses are also given of three varieties of wheat grown in both the Northwest and the Northeast. The results, while not considered very conclusive, showed a difference of over 1 per cent. of protein in favor of the wheat grown in the Northwest. The distribution of the nitrogen in the milling products was determined in a number of experiments. H. W. LAWSON.

Breakfast Foods. BY J. B. WEEMS AND C. E. ELLIS. *Ia. Agr. Expt. Sta. Bull. No.* 74, pp. 99–114.—Some of the extravagant claims made by the manufacturers of breakfast foods are quoted, and analyses of about 30 of these products are reported and discussed. Grape nuts, one pound of which is claimed to be equal to ten pounds of beef, is shown to contain much less protein and fat than beef. The so-called predigested foods showed no very great increase in the sugar content. Oats, wheat, barley, and corn are used in the preparation of these products, though most of them are evidently prepared from wheat. While the cereals cost about one-half to 1 cent per pound, and the milled products as sold by the wholesale merchant 1½ to 3 cents, the unprepared breakfast foods sold in attractive packages cost 6 to 7 cents per pound, and the prepared foods 10 to 16 cents. The nutritive value does not exceed that of ordinary food materials, though in many cases the breakfast foods may be more palatable. They have no medicinal value, and it seems unnecessary to make such representations. Little or no reliance can be placed upon the exaggerated, and in some instances ridiculous, statements of the manufacturers. H. W. LAWSON.

Adulterated Drugs and Chemicals. BY L. F. KEBLER. *U. S. Dept. Agr. Bureau of Chem. Bull. No.* 80, 47 pp.—Three papers are included in this bulletin :

Inferior Drugs and Insidious Methods of Deception.—The forms of adulteration of drugs are classified as (1) conventional, (2) accidental or incidental, (3) arbitrary, and (4) intentional ; and specific examples are cited to illustrate each form. Conventional adulterations include such practices as the bleaching of ginger and the artificial coloring of products. The carmine in 6 samples of cochineal was determined by oxidation with potassium ferricyanide and colorimetrically by comparison with a standard potassium permanganate solution, the results running nearly parallel. Accidental adulterations, such as the admixture of stems, foreign leaves, dirt, etc., frequently amount to 20 per cent. or more. A sample of golden seal root showed 23.8 per cent. of ash, while a normal root contains less than 10 per cent. A sample of chimaphilla leaves contained 25 per cent. of stems, and a sample of jaborandi leaves not less than 16 per cent. A sample of cubeb berries contained 15 per cent. of stems and 11 per cent. of worthless berries. Attention is called to the frequency of impurities in so-called chemically pure reagents, numerous instances in the author's experience being cited. The author believes that the term "C. P." at present means nothing, and that specific standards for chemical reagents should be established. Adulterations resulting from arbitrary standards, such, for instance, as the occasional dilution of opium to meet the U. S. P. requirements, are mentioned. Four samples, labeled potassium cyanide 98 to 100 per cent. pure, were found to contain from 22 to 74 per cent. of sodium cyanide. A gravimetric method of estimating chlorides in soluble cyanides, based upon the oxidation of the cyanide by potassium permanganate, is described. Numerous other illustrations than potassium cyanide are given of intentional adulterations. A sample of beeswax was found to contain 33 per cent. of starch. It is stated that 25 per cent. of the turpentine purchased in small packages is liberally adulterated with kerosene. A sample of belladonna leaves submitted for examination showed 0.438 per cent. of total alkaloids. The consignment as delivered showed only from 0.10 to 0.30 per cent. in the 9 bales examined.

Rose Geranium Oil and Its Substitutes.—Analytical data for 13 samples of geranium and allied oils are given and comments are made upon the purity and quality of each. The analytical methods at present available for the examination of geranium oil are considered entirely unsatisfactory for the detection of skillful adulteration.

Phenacetin: Methods of Analysis and Commercial Status.—The history of phenacetin is reviewed, methods of manufacture are outlined, and physical and chemical tests are described. The most reliable test for establishing the purity of phenacetin at present is its melting point, which is near 135° C. Of 9 samples purchased in Washington and Philadelphia one was adulterated, containing about 20 per cent. of acetanilide.

The Testing of Road Materials. BY L. W. PAGE AND A. S. CUSHMAN. *U. S. Dept. Agr., Bureau of Chem. Bull. No.* 79, 77. pp.—The results of tests of a large number of materials conducted in the road material laboratory of the Bureau of Chemistry since its establishment in December, 1900, are reported, and the methods employed are described in detail. A considerable portion of the bulletin is devoted to a discussion of the properties of road materials, the causes of the deterioration of roads, and a history of the testing of road materials. While the main object of the laboratory is the testing of materials for road making, attention is also being paid to other subjects, such as the collection of data for use in drawing up specifications for standards of quality and the development of new materials or mixtures. The practical application of laboratory results is discussed. Methods of chemical analysis especially adapted to the rapid examination and classification of road materials are given in an appendix.

H. W. LAWSON.

Washington Soils. BY E. FULMER. *Wash. Agr. Expt. Sta. Bull. No.* 55, 32. pp.—Analyses of 79 samples of soils from eastern and western Washington are reported. It is believed that valuable conclusions may be drawn from chemical composition alone. In regions having abundant rainfall the soils showed low percentages of lime and potash, while in arid regions there was a good supply of lime but low amounts of potash and humus. In general, a low percentage of lime was associated with a high rainfall. An unusual occurrence in non-alkali soils was the relatively larger amount of soda than potash in certain localities, which is attributed to the basaltic origin of the soil and to climatic conditions. H. W. LAWSON.

PATENTS.

SEPTEMBER 1, 1903.

737,579. Ernst Burchell, Landau, Germany. **Purifying gas.** Treats the gas with an oxidizing solution containing both copper and iron salts, by which the hydrogen sulphide particularly is removed.

737,625. John B. F. Herreshoff, N. Y. Assignor to General Chemical Co., same place. Making **sulphuric acid.** Liquid sulphuric acid and gaseous sulphuric anhydride are made to travel in opposite directions in contact with each other, reserving a portion of the acid thus produced as the final product of the process, diluting and cooling the remainder of the strong acid, and returning such diluted and cooled acid to the first stage of the process to again absorb the anhydride. The relative proportions of gas and acid brought in contact are automatically regulated.

737,626. As above, for the apparatus required to carry out the process. The relative proportions of the supply of raw material are regulated by floats working in open tanks containing the acid.

737,634. Karl Kiefer, Cincinnati, Ohio. **Clearing champagne** in bottles. When the fermentation in the bottle is finished, the wine is drawn off into a common container. sweetening added, it is filtered, and rebottled, the whole operation being conducted under as great pressure as was produced by fermentation.

737,740. Charles B. Jacobs, East Orange, N. J. Assignor to United Barium Co., Jersey City, N. J. **Caustic soda and barium sulphate.** Barium sulphate is reduced by carbon to barium sulphide, barium oxide and sulphur dioxide, water is added to the barium oxide and sulphide to produce barium hydroxide, sodium chloride is changed into sulphate by the sulphur dioxide, and this reacts on the barium hydroxide to make barium sulphate and caustic soda.

737,780. Wilhelm Schubbert, Berlin, Germany. Making **wigs.** The foundation is coated with celluloid and a volatile liquid solvent as acetic ether, it is then pressed on the bald part of the head and when the liquid solvent has evaporated and the celluloid hardened it is removed.

737,836. Willibald Hentschel, Radebeul, Germany. Assignor to Chemische Fabrik von Hayden Actiengesellschaft, same place. **Indoxyl.** Phenyl glycin is heated with caustic alkalies, alkali alcoholates and earthy alkalies to make indoxyl and indigo preparations.

737,882. Otto C. Strecker, Darmstadt, Germany. **Lithographic plates.** A metal plate is polished and made an electrolyte in a solution adapted to deposit a metallic salt on the plate as aluminum or zinc oxide, or a figure to be printed may be first fixed on the plate, the salt deposited around it, and the layer of salt changed by chemical reagents as weak acids to a material adapted for lithography which may be a metal or an insoluble salt.

737,967. Friedrich Schmidt, Hochst-on-Main. Assignor to Farbwerke, vorm Meister Lucius und Bruning, Hochst-on-Main, Germany. Violet red **azo dye.** β-Naphthylamine-α-1-α-4-β-4-trisulphonic acid is diazotized, treated with alkali carbonates, and the naphthalene 2-1-diazoxide-5-7-disulphonic acid thus formed is combined with β-naphthol. If salted out from an acid solution, it is red, from an alkaline solution blue, soluble in diluted ammonia blue, and in concentrated sulphuric acid violet, on adding water, brown flakes are precipitated.

737,994. Carl W. Bilfinger and Clarence F. Halleck, Moultrie, Ga. **Turpentine still.** A chamber is provided with a firebox in its bottom and two stills on the firebox with their heads projecting above said chamber, condensers and connecting pipes.

738,002. Mathilde R. Cords, San Francisco, Cal. Assignor to Pacific Pine Needle Co., same place. **Pine needle mattress stuffing**. The pine needles are boiled in water under pressure, the water changed twice, drained after cooling, the needles crushed, dried and picked while warm.

738,007. Oliver B. Dawson, Caldwell, N. J. **Reducing minerals.** The ores are heated to a red heat in the presence of hydrogen gas in excess, and then to a higher heat, which causes them to agglutinate in globular masses.

738,110. Ernst W. Jungner, Norrkoping, Sweden. **Reversible galvanic battery**. An alkaline hydroxide as electrolyte, an electrode of iron oxide, another of manganese oxide, said electrodes insoluble in the electrolyte and the first becomes $M(OH)_{n-x}$, the second $M_1(OH)_{n-x}$ on discharging.

SEPTEMBER 8, 1903.

738,151. Alfred E. Berry, Stratford, England. Assignor to A. Boake Roberts & Co., same place. **Fining.** Emulsions of isinglass are precipitated by a salt as sodium chloride or sulphate, and an acid is added after precipitation, such as boric or tartaric, which acts as an emulsifier and preservative.

738, 200. Franz Jurschina, Stockholm, Sweden. **Artificial**

stone. Clay and an alkaline silicate are mixed to a homogeneous mass, which is stirred into a mixture of cement and sand, and the whole molded, dried and fired.

738,227. Oscar Nastvogel, Elberfeld, Germany. Assignor to Elberfeld Co., New York, N. Y. **Red dye.** Soluble in water and alcohol red with yellow fluorescence, soluble in concentrated sulphuric acid of 60 Beaumé yellow, a red body being precipitated by the addition of ice, dyeing tannin mordanted cotton red shades. Derived from one molecule of benzaldehyde and two of *o*-alkylamino-*p*-cresol.

738,239. Isaiah L. Roberts, Brooklyn, N. Y. Assignor to Roberts Battery Co., same place. **Zinc and chromium hydroxides.** Calcium chloride is added to a solution of sulphates of the above metals, and to the resulting chloride an insoluble carbonate is added to precipitate chromium hydroxide, then adding calcium hydroxide to precipitate zinc hydroxide.

738,274. Jean Bardin, Brussels, Belgium. **Perfumes** and **disinfectants.** Stearate or margarate of soda is melted and alcohol added in such proportion that the mixture is solid when cold, then the desired perfume or disinfectant is added and the mixture cooled. Menthol, capsicum, iodine, etc., may be used.

738,303. Herbert S. Elworthy, London, England. Making **gas.** One-half assigned to Ernest Henry Williamson, same place. Water gas is made by passing steam over ignited carbon and sufficient hydrogen added to convert the carbon monoxide to methane and water, and the mixture is passed over metallic nickel, whereby the carbon is hydrogenized and the oxygen liberated is converted into water.

738,313. Oliver P. Fritchle, Denver, Col. **Storage battery** electrodes. Molten lead is sprayed by a blast on the plate, then treated with hydrochloric acid and heat, and then compressed into a coherent porous mass.

738,314. **As above** for the apparatus to carry out the process. A broad shallow basin is placed over a fire, and provided with a support for the plate above the bottom. The basin is filled with hot hydrochloric acid, through which the lead is showered.

738,326. Patillo Higgins, Beaumont, Texas. **Mining sulphur.** Two pipes are inserted in the sulphur bed from the surface, through one is sent down hot air under heavy pressure, which forces melted sulphur up the other pipe, suitable valves and tank connections being provided.

738,328. Jean J. Hignette, Paris, France. **Defecating saccharine juices.** Limed juice is continuously introduced into a centrifugal along with carbon dioxide, and the separated mud is carried to a second centrifugal, where it is further treated with carbon dioxide.

738,363. Wm. J. Shelton, Van Vleck, Texas. Assignor to Charles M. Browning, same place. **Poison holder.** Two circular disks with annular grooves are riveted together so as to form an annular poison receiving pocket with a contracted mouth.

738, 388. Wm. A. O. Wuth, Pittsburg, Pa. **Cement.** Limestone is mixed with a solution of sodium nitrate, ground, mixed with blast-furnace slag, and burned.

738,389. As above, assigned to International Cement Co., N. J. Process of making **cement.** Limestone, blast-furnace slag and sodium nitrate are ground together dry, and then burned.

738,397-8. Jules A. Besson, Caen, France. The first for apparatus for **concentrating sugar juice,** the second for **purifying** it by stirring and adding powdered aluminum into the boiling pan. The apparatus is chiefly a screw feed for the juice through a cooling vat provided with spiral deflecting plates.

738,404. Max Buchner, Mannheim, Germany. Assignor to C. F. Boehringer Sohne, same place. **Reducing nitro compounds.** Aromatic nitro compounds are mixed with copper and concentrated hydrochloric acid, cooling and stirring.

738,427. Oliver P. Fritchle, Denver, Colo. **Storage battery plates.** A support, on which a clean granulated lead is compressed into a coherent, porous mass. See Nos. 758,313-14, and 738,314.

738,456. Johann E. Kollinger, Munich, Germany. **Paint.** Tallow and vegetable oil 14, mineral oil 230, resin 60, saponified resin 40, and a pigment. Various proportions are described.

738,461. Philipp Lewy, Charlottenburg, Germany. **Medicinal oils.** Oil, gum arabic and water are emulsified, burnt magnesia added till on standing a solid mass is formed, which is powdered.

738,481. Wm. C. Pope, St. Louis, Mo. **Effervescent laundry blueing.** Tartaric acid 5, oxalic acid 3, an alkaline carbonate 13, and soluble blue 6. The blue and oxalic acid are mixed separately and equal parts of both mixtures taken.

738,533. Arthur Eichengrun and Theodore Becker, Elberfeld, Germany. **Plastic composition.** Made of acetyl cellulose and camphor in proportions as required.

738,614. Max H. Isler, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Bavaria, Germany. **Anthracene dye.** The sulpho methylene derivative of diamino-anthraquinone is halogenized and combined with *p*-toluidine and then sulfonated. It dissolves in water, aniline and alcohol-blue to blue-green, in concentrated sulphuric acid violet-red, which greens on the addition of boric acid and it dyes chrome mordanted wool, blue-green.

738,656. Arthur W. Burwell and Layton O. Sherman, Cleveland, Ohio, said Burwell assignor to Sherman. **Desulphurizing petroleum.** Crude petroleum is vaporized and the first part containing water is rejected, the other vapors brought in contact with a mixture of dry finely divided iron oxide and an alkaline earth metal at a temperature just sufficient to maintain the oil in vapor.

738,702. John G. Scheinert, Chicago, Ill. **Lard compound.** Chinese wax 8, Japanese wax 2, stearine 4, tallow 2, and cottonseed oil 84 parts. In winter more oil may be used.

738,703. Gottfried Schmalfuss, Cologne, Germany. Assignor to Henry Lierz, Philadelphia, Pa. **Adhesive tablet.** Dextrine and sugar compressed into tablet form while dry.

738,709. Herman Weiss, Hilchenbach, Germany. **Glue.** Leather waste is treated with acid, then with alkali, washed and the treatment repeated, till it can be reduced to glue in the usual manner.

738,718. Lothar Fiedler, London, England. Assignor one-half to George Pearson, Pitfour, Ilford, England. **Galvanic cell.** A rectangular tube positive electrode of lead peroxide, and a negative electrode of similar shape surrounding the first and connected with a series of plates inside the first, and having active surfaces of cyanide of zinc and mercury, an electrolyte of sodium silicate, sulphuric acid, and mercuric sulphate and an outer insulating vessel adapted to contain the combination.

738,719. As above for the process of making a **negative electrode** by making a zinc plate the cathode in a solution of zinc sulphate 1000, mercuric sulphate 50, potassium cyanide 10, made up with water to 30° Beaumé.

738,733. Arvid Reuterdahl, Providence, R. I. **Reducing aluminum by hydrocarbons.** Alumina is powdered and mixed to a paste with a liquid hydrocarbon, then heated in a closed vessel with a current of acetylene, and the aluminum removed.

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738,758. Jose B. Alzuraray, London, England. Assignor to Baxeres Gold Extraction Co., same place. The crushed **ore** is moistened with an alkaline solution, then dissolved in potassium cyanide, through which vaporized bromine and hydrobromic acid are blown by an air blast, and the metals recovered from their solutions by usual processes.

738,905. Max Honig, Brunn, Austria-Hungary. **Extracting tannin.** The leaching of the tanbark is done with the waste sulphite lyes from the sulphite wood pulp process used hot from the digester, and then treating the solution with zinc and sulphuric acid.

738,966. Frederick J. Warren, Newton, Mass. **Coal tar cements.** Lampblack is added to the cement or pitch in predetermined quantity in order to diminish its viscosity.

739,011. Frederick Laist, Salt Lake City, Utah. Assignor to Hudson Smith and Peter C. Brown, same place. Obtaining **copper.** An alkaline earth sulphide in water is treated with carbon dioxide, the hydrogen sulphide formed is led into a solution of copper carbonate in sulphuric acid, precipitating copper sulphide and recovering the solvent, the sulphide is oxidised to metal and sulphur dioxide, which acts on calcium carbonate to make calcium sulphite and carbon dioxide, the latter used in the first reaction, and the sulphite reduced to a sulphide.

739,069. Otto Ernst and Franz Scholl, Hochst-on-Main, Germany. Assignors to Farbwerke, vorm. Meister, Lucius und Bruning, same place. **Red mordant azo dye.** Diazotized *o*-aminocresol sulphonic acids are combined with 1-phenyl-5-pyrazolones. An orange powder difficulty soluble in cold water, insoluble in absolute alcohol, ether and benzene, it dyes wool yellow in acid bath and forms a red chrome lake.

739,071. Emile A. Fourneaux, New York, N. Y. Assignor to Hermann A. Metz, same place. **Dyeing brown.** An aromatic *m*-diamine compound of the benzene series is oxidized on the fiber.

739,104. Rafael Ostredjko, Satkuny, Russia. **Carbon of great decolorizing power.** Powdered carbon is well moistened and distilled in small lots without access of air at a high temperature, then adding superheated carbon dioxide to the vapors and treating it with this mixture as long as it was in distilling, then purifying the carbon with acid and washing it with water.

739,108. Herman Rabe, St. Petersburg, Russia. **Purifying gases** containing sulphurous acid. Said gases are passed through wide and thin layers of filtering material and then a liquid, as water, is vaporized in contact with them so as to cool them below 100° C. so that there is no condensation on a glass intercepting dish, and the gases are fit for the contact process.

739,116. Charles T. Snedekor, Chicago, Ill. **Disintegrating ores.** They are first wet with alkali, heated very hot and returned to the alkaline solution.

739,117. Otto Sohst, Hochst-on-Main, Germany. Assignor to Farbwerke, vorm. Meister, Lucuis und Bruning, same place. **Yellow acridinum dye.** Leuco compounds of amino acridine dyes are heated with dilute hydrochloric acid and alcohol to a high temperature and then oxidized. Soluble in concentrated sulphuric acid yellow with green fluorescence.

739,137. Carl Bache-Wiig, Bon, Norway. Assignor to Bertha Bache-Wiig, same place. **Preserving eggs.** Eggs heated to

140° to 150° F. are coated with waste sulphite lye freed from sulphur compounds.

739,139. Charles E. Baker and Arthur W. Burwell, Cleveland, Ohio. **Recovering metals.** The metallic compound is electrolyzed with a liquid cathode of a metal as mercury, more volatile than the metal to be recovered, distilling the resulting amalgam or alloy, condensing the vaporized cathode metal and returning it as condensed to the cathode.

739,140. Charles E. Baker and Arthur W. Burwell, Cleveland, Ohio. **Oxidizing metals** dissolved in mercury. A vessel for containing amalgam with inlet and outlet for continuous supply and discharge, an oxidizing electrolyte in contact with the amalgam, an inlet for the electrolyte above the mercury outlet, and an outlet for the electrolyte above the amalgam inlet, and a carbon in contact with both·amalgam and electrolyte, and having a secondary surface in direct electrical contact with the amalgam.

739,145. Rene Bohn, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. **Yellow anthracene dye.** Derived from *b*-aminoanthraquinone, a brown substance insoluble in water, turning blue with caustic soda and sodium hydrosulphite, becoming yellow when treated with air.

739,229. Edward Shaw, London, England. **Making sweetmeats.** Tartaric acid is added to sugar $3^1/_2$ ounces to 112 pounds, alkali equal to 75 per cent of the acid is added to another part of sugar, and the 2 parts mixed ·and boiled; being about 4 parts of plain sugar to one of inverted.

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739,356. Wm. M. Spore, Argenta, Ill. **Chlorate powder.** Potassium chlorate 1 pint, cornstalk pith $2^1/_2$ pints, and white of eggs sufficient to make a plastic mass which is granulated.

739,374. Charles E. Baker and Arthur W. Burwell, Cleveland, Ohio. Treating **complex gold and silver ores.** Gold and silver ores containing a base metal and a metalloid are heated and treated with chlorine and the metalloid chloride separated from the base metals of the ore.

739,375. Charles E. Baker and Arthur W. Burwell, Cleveland, Ohio. **Sodium peroxide.** Sodium is melted and air is blown through it.

739,400. Eugene W. Deming, New Orleans, La. **Clarifying sugar.** Impure saccharine solutions are heated above their atmospheric boiling-point under pressure, and the impurities settled out of a moving column.

739,444. Alexander S. Ramage, Cleveland, Ohio. **Pigment.** Ferrous sulphate liquors are blown with air and the free acid neutralized, whereby basic ferric sulphate is precipitated, the remaining liquor is oxidized till two-thirds converted to ferric iron and then heated with alkali hydroxide or carbonate to precipitate ferroferric iron on top of the basic ferric sulphate. The pigment is therefore a mixture of these iron salts.

739,448. Marcus Ruthenberg, Harrisburg, Pa. **Bleaching compound.** A sodium chloride brine of 20 per cent. is mixed with milk of lime 10 per cent., the whole electrolyzed at the rate of a half ampere per square inch of electrode, at a pressure of 3 volts till all bases are changed to hypochlorites.

739,514. Ernest A. G. Street, Paris, France. Assignor to Société Anonyme le Carbone, Levallois-Perret, near Paris. **Insulating and water-proofing composition.** Glass articles are coated with celluloid.

739,519. Charles C. Trerkildsen, Chicago, Ill. **Preserving compound.** Sand 200, slaked lime 12, water 25, and linseed oil four-fifths pounds. For packing eggs.

739,579. Rene Bohn, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhein, Germany. **Blue anthraquinone dye.** A halogenized hydrated β-amino anthraquinone blue dye, which is developed with air on unmordanted cotton, and which on treatment with a hypochlorite containing one-fourth per cent. active chlorine for ten minutes at 15° C. suffers no change.

739,657. Andrew A. Dunham, New York, N. Y. Assignor to Casein Co., of America. **Sizing.** Dry granular casein is added to a solution of animal glue, and the mixture thoroughly incorporated and dried.

739,702. Leon Naudet, Paris, France. Apparatus for **carbonating sugar juice.** A treating vessel and pipe to introduce alkaline sugar juice to its bottom, and a pipe for carbon dioxide, both pipes provided with screens and valves to regulate supply and level of juice.

739,751. John E. Bland and Edward J. Gilligan, Pawtucket, R. I. Assignors one-half to Edward W. McDuff and Frank J. McDuff, same place. **Bleaching.** The yarn cops or bobbins are placed between two perforated diaphrams and the bleach liquor sprayed over the upper one and allowed to run through by gravity, the materials being intermittingly reversed.

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739,825. George D. Burton, Boston, Mass. Process of **treating hides.** The hides or skins are hung in a depilating solution and a current of electricity passed through in a line parallel with the hides and of sufficient volume to open their pores and increase the action of the solution, aided also by a current of air blown through.

739,835. Mathilde Cordes, geboren Muller, Hanover, Germany. **Artificial stone.** Hydraulic lime and barium hydroxide or carbonate are mixed with water and gypsum; ashes and comminuted peat are mixed therewith.

739,920. Harry Pauling, Brandau, Austria-Hungary. **Apparatus for treating gases.** A cylinder through one end of which enters a nozzle for gas delivery and the other end provided with a perforated disk attached to a pipe, disk and nozzle both being electrodes to pass a current through the gas.

739,921. As above for **similar apparatus.** A rotable cylinder surrounded by a helix, a gas supply through numerous nozzles arranged to play in line on the cylinder, a conducting bar on the opposite side of the nozzles, and a supply of current and power for rotation.

739,936–7. John T. Smith, Heron Lake, Minn. **Artificial fuel**, and apparatus for making same. Flax shives and similar waste material is exposed to a blast of steam and petroleum, thoroughly mixed and compressed. The apparatus is an inverted cone, through which the material is fed, with steam and oil supply, a disintegrator and press below it.

739,941. Carl Spengler, Davis-Platz, Switzerland. **Disinfectants.** A solution of organic acids is made in ethyl alcohol, to which formaldehyde is added. Used as an inhalant.

739,958. Benjamin J. Walker, Erie, Pa. Process of **burning pulverized fuel.** The powdered fuel is delivered by opposing blasts so as to spread it at right angles to the blast by impact and to keep it suspended during combustion.

740,006. Charles I. Goessmann, Worcester, Mass. **Toughening paper.** The paper is treated first on one side and then on the other with hot glue, dried and exposed to the action of the formaldehyde and again dried.

740,014. John Herman, Lincoln, Neb. **Treating ores.** Oxides and carbonate of copper are dissolved by ferrous chloride and free acid, the ore is then leached with water or ferrous chloride and common salt and the copper precipitated by electrolysis, to regenerate the acid.

740,025. Wm. A. Koneman, Chicago, Ill. **Carburizing iron.** Molten iron is separated from the slag and poured onto a deep bed of incandescent fuel, through which it percolates while a current of oxygen is sent up against a descending iron which is carburized by the carbon and the gases generated therein.

740,034. Job T. Niblett, Greenwith, London, England. **Storage battery plates.** Plates molded from electrolytic lead and kieselguhr, the positive plate with 5 per cent. of kiselguhr, the negative with 2½.

W. H. Seaman.

IEW OF AMERICAN CHEMICAL RESEARCH.

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INORGANIC CHEMISTRY.

Rubidium-Barium-Silver Thiocyanates. By H. L.
. *Am. Chem. J.*, 30, 184–187.—Two triple salts were
d: The 4 : 1 : 2 salt, $Rb_4BaAg_2(SCN)_8.H_2O$, and the
salt, $Rb_2BaAg_2(SCN)_6.2(?)H_2O$. Both are very soluble
not form good crystals. H. N. McCoy.

**he Double and Triple Thiocyanates of Caesium, Cad-
and Silver.** By H. L. Wells. *Am. Chem. J.*, 30, 144–
The following salts were obtained: 1 : 1 Caesium-cadmium
nate, $CsCd(SCN)_3$, large, colorless crystals, which melt at
214°, and can be recrystallized from water. 4 : 1 Caesium-
m thiocyanate, $Cs_4Cd(SCN)_6.2H_2O$, large, colorless, tabu-
stals, which are stable in air and fuse at 80° to 90° with
water. Anhydrous, 2 : 1 : 2, caesium-cadmium-silver thio-
:, $Cs_2CdAg_2(SCN)_6$, white precipitate or groups of brilliant
ıles. The same salt also crystallizes with $2H_2O$ in needles.
s water on exposure to air. 2 : 1 : 4, caesium-cadmium-
hiocyanate, $Cs_2CdAg_4(SCN)_8.2H_2O$, has been observed in
lifferent habits. 4 : 3 : 10, caesium-cadmium-silver thio-
:, $Cs_4Cd_3Ag_{10}(SCN)_{20}.6H_2O$, brilliant colorless, or faintly
sh crystals. In the discussion the formulas of these salts
ıpared with those of previously known double and triple
related types. H. N. McCoy.

lodocyanides of Potassium and Caesium. By C. H.
ɛwson and H. L. Wells. *Am. Chem. J.*, 30, 430–432.—
um iodocyanide, $KI.4ICN.H_2O$, was made by dissolving
with or without the addition of potassium iodide, in con-
ed potassium cyanide solutions. It forms small colorless
, which lose cyanogen iodide rapidly when exposed to air.
n iodocyanide $CsI.2ICN$, was prepared like the potassium

compound, or from caesium iodide and cyanogen iodide. It gives off cyanogen iodide slowly. H. N. McCoy.

On a Compound of Mercuric Cyanide and Caesium Iodide. By C. H. Mathewson and H. L. Wells. *Am. Chem. J.*, 30, 432–433.—The double salt $CSI.Hg(CN)_2$, is readily obtained from aqueous solutions of its components. It forms thin white pearly plates, which may be recrystallized unchanged from water.

H. N. McCoy.

On a Double Salt of Potassium and Barium Nitrates. By Wm. K. Wallbridge. *Am. Chem. J.*, 30, 154–156.—The double salt, $2KNO_3.Ba(NO_3)_2$, forms white opaque tetrahedral crystals, which can not be recrystallized from water without decomposition. It is the only known double salt of barium and the alkali metals, and also the only crystalline double salt of an alkaline nitrate with the nitrate of a bivalent metal.

H. N. McCoy.

The Action of Phosphonium Iodide on Polychlorides. [First Paper.] By Ernestine and Peter Fireman. *Am. Chem. J.*, 30, 116–133.—Phosphonium iodide and antimony pentachloride were heated in sealed tubes to 110°. The amounts of the products obtained led to the equation:

$$3SbCl_5 + 3PH_4I = SbI_3 + 2SbCl_3 + 9HCl + PH_3 + P_2.$$

Phosphonium iodide and phosphorus pentachloride heated in sealed tubes to 125° gave results leading to the equation:

$$3PCl_5 + 3PH_4I = PI_3 + PCl_3 + 12HCl + P_4.$$

With stannic chloride the nature of the reaction seemed to depend on the temperature to which the mixture was heated. At 160° the reaction is represented by the equation:

$$4SnCl_4 + 4PH_4I = SnI_4 + 3SnCl_2 + 10HCl + 2PH_3 + P_2.$$

At 260° stannous iodide is formed instead of the stannic salt.

H. N. McCoy.

The Chemical and Physical Characters of the So-called "Madstone." By H. C. White. *Chem. News*, **88**, 180.—The "madstone" of current superstition is a very rare concretionary calculus found in the gullet of the male deer. As extracted, it resembles a water-worn stone about 3 inches long and 1½ inches thick. It is chiefly tricalcium phosphate. Such stones when immersed in water absorb about 5 per cent. of water. If applied to fresh wounds, blood and other fluids are absorbed to a maximum extent of 2.3 per cent. of the weight of the stone. That the stones are not curative is shown by the death of animals from venomous wounds, after application of the stone. H. N. McCoy.

On Some Manganic Periodates. By W. B. Price. *Am. Chem. J.*, 30, 182–184.—By the addition of sodium or potassium iodate, or free iodic acid to a solution of manganous sulphate containing nitric or sulphuric acid, bright red precipitates are obtained. These are periodates. The following were obtained: $Na_2Mn_2I_2O_{11}$; $K_2Mn_2I_2O_{11}$; $H_2Mn_2I_2O_{11}$. They are insoluble in boiling water and in boiling nitric or sulphuric acids.

H. N. McCoy.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

Notes on Some California Minerals. By Waldemar T. Schaller. *Am. J. Sci.*, **17**, 191–194.—*Halloysite* occurs in large seams in the lepidolite mine near Pala, San Diego County. The clay is pink, occasionally somewhat translucent when moist, dries to a crumbling powder, and falls to pieces in water. Analysis of material air-dried for three months afforded results agreeing with the formula $H_4Al_2Si_2O_9.H_2O$, namely: SiO_2, 43.62; Al_2O_3, 35.55; Fe_2O_3, 0.21; MnO, 0.26; CaO, 1.02; MgO, 0.19; Li_2O, 0.23; Na_2O, 0.19; K_2O, 0.03; H_2O (107°), 6.63; H_2O (above 107°), 12.25; TiO_2, none. Total, 100.18. *Amblygonite* from the above locality was found to have the following composition: P_2O_5, 48.83; Al_2O_3, 33.70; Fe_2O_3, 0.12; MnO, 0.09; MgO, 0.31; Li_2O, 9.88; Na_2O, 0·14; H_2O, 5.95; F. 2.29; TiO_2, none. Less O for F, 0.96. Total, 100.35. *Boothite* has been found at a second locality, the copper mine near Campo Seco, Calaveras County. Its composition is: CuO, 26.13; FeO, 0.81; MgO, 0.64; SO_3, 27.25; H_2O (110°), 36.76; H_2O (above 110°), 4.91; insol., 3.96. Total, 100.46. Spec. grav., 1.944 at 21°. A redetermination of the specific gravity of the original mineral from Leona Heights, but of purer material than was at first obtainable, gave 1.935 at 22°, so that 1.94 may be regarded as very near the true specific gravity of the mineral. *Pisanite* from Gonzales, Monterey County, was found to have the composition: CuO, 7.56; FeO, 15.85; SO_3, 30.74; H_2O, 45.85. Total, 100.00. Comparison of all available analyses of pisanite shows no definite ratio between copper and iron. The formula is then $(Cu, Fe)SO_4.7H_2O$, and the mineral is an isomorphous mixture of melanterite and boothite. *Quartz pseudomorph after apophyllite.* Found at the datolite and pectolite locality near Fort Point, San Francisco, showing three forms of apophyllite. Composition essentially silica (90.58), with the balance alumina, lime, magnesia, and water.

W. F. Hillebrand.

Crystallographical and Chemical Notes on Lawsonite. By W. T. Schaller and W. F. Hillebrand. *Am. J. Sci.*, **17**, 195–197; figure.—Crystals of lawsonite occur in two habits and are simple in their combinations. To the five forms previously described, two new ones are to be added, namely, 221 and 331. It is possible that the form 034 also occurs. Carefully purified material of specific gravity 3.121 at 25° afforded the following values which agree well with the formula $H_4CaAl_2Si_2O_{10}$, deduced from Ransome and Palache's rather widely differing analyses: SiO_2. 38.45 ; TiO_2, 0.38 ; Al_2O_3, 31.35 ; Fe_2O_3, 0.86 ; FeO, 0.10 ; MnO, faint trace ; CaO, 17.52; MgO, 0.17; K_2O, 0.23; Na_2O, 0.06; H_2O(ign.), 11,21. Total, 100.33. Additional blowpipe characteristics are given. The fusion at first observed is but transitory, and then the highest attainable heat is required to further soften and round the edges. With rather large splinters very marked exfoliation occurs, and it may happen that on momentary application of the flame a singularly shaped excrescence shoots out.

W. F. HILLEBRAND.

Nodular Barite and Selenite Crystals of Montana. BY J. P. ROWE. *Am. Geologist*, 33, 198–199.—Crystals of selenite are, so far as known to the writer, found in Montana only at a point on Beaver Creek about three and one-half miles south of Wiboux, though the uncrystallized mineral is abundant in the eastern half of the state. Those found are beautiful and perfect, and two analyses show normal composition. Barite, both crystallized and nodular, has been found in several places. An analysis is given of the latter, which shows no strontia. W. F. HILLEBRAND.

Prismatic Crystals of Hematite. BY G. W. MCKEE. *Am. J. Sci.*, 17, 241–242 ; figure.—Prismatic habit is shown by small bright crystals from Guanajuato, Mexico, spread on the surface of what appears to be decomposed rhyolite. They are not accompanied by cassiterite, as were similar crystals from Mexico described by Pirsson (*Am. J. Sci.*, 42, 407, 1891).

W. F. HILLEBRAND.

On a California Roofing Slate of Igneous Origin. BY EDWIN C. ECKEL. *J. Geol.*, 12, 14–24.—In a black roofing slate at Slatington, near Placerville, Eldorado County, occurs a green band about four feet wide which on structural grounds alone is considered to represent a mass of injected igneous rock, which has been subsequently so sheared as to have assumed slaty cleavage. Such a derivation for a slate does not seem to have been hitherto considered. The chemical differences are so pronounced, as shown by the following partial analyses of W. T. Schaller, of the U. S. Geol. Survey, that a difference of origin seems called for on that ground also.

	SiO_2.	$Al_2O_3.TiO_2$.	FeO,Fe_2O_3.	CaO.	MgO.	CO_2,H_2O.
Black slate......	63.52	16.34	6.79	0.98	2.50	4.86
Green slate	45.15	16.33	8.42	6.42	8.72	11.28

The composition of the green slate approaches that of some of the igneous rocks of the region and differs widely from that of any normal clay state. W. F. HILLEBRAND.

On the Chemical Composition of American Shales and Roofing Slates. BY EDWIN C. ECKEL. *J. Geol.*, 12, 25–29.—Based on all the available analyses of American roofing slates (36, of which 35 were paleozoic) and of analyses of composite samples of both paleozoic and later shales made some years since by H. N. Stokes, it is concluded that "the average slate is practically identical in composition with the average [paleozoic] shale. It contains *slightly* more of certain readily soluble constituents than does the average shale. This is to be accounted for by the fact that the slate is, on the whole, made up from finer materials than the shale; if it were otherwise, its cleavage would not be so perfect." W. F. HILLEBRAND.

Gases in a Metalliferous Mine. BY HARRY A. LEE. *Proc. Colorado Sci. Soc.*, 7, 163–188.—The Happy Thought mine near Creede, Colorado, is one in which the conditions for good ventilation would seem to be almost ideal, yet "bad air" exists in it at times in great volume and appears and disappears at comparatively short intervals. It is lighter than air since it seeks the upper portions of drifts. An analysis by W. F. Edwards showed only 3.92 per cent. oxygen and 96.08 nitrogen. It is more abundant at times of low barometer, and disappears sometimes wholly when the atmospheric pressure is high. It issues in great quantity from a highly brecciated portion of a great fault-fissure vein, in which there must be extensive reservoirs. The outflow or inflow through openings in the breasts of drifts is at times sufficiently powerful to be distinctly audible and to blow the flame of a candle nearly horizontal. Whether the concentration of nitrogen has been due to abstraction of oxygen from air by sulphides, or whether the nitrogen came from the depths is not indicated.
W. F. HILLEBRAND.

Death Gulch. BY F. W. TRAPHAGEN. *Proc. Colorado Sci. Soc.*, 7, 189–192.—In a paper following the above it is stated that the deadly gas which has given this noted place in the Yellowstone National Park its notoriety, issues from crevices up the sides of the gulch. A sample collected at a point of outflow, but which may well have become diluted with air, showed 1 per cent. of hydrogen sulphide and over 50 per cent. of carbon dioxide, and air from near the bottom of the gulch contained over 11 per cent. of carbon dioxide and strong traces of hydrogen sulphide. It is suggested that the latter gas may possibly be largely accountable for the fatalities to beasts that are of such frequent occurrence there. W. F. HILLEBRAND.

Magmatic Segregation of Ores. BY BLAMEY STEVENS. *Eng. and Min. J.*, 77, 311.—The author proposes a hypothesis, based on observations made in Alaska, to account for the two recognized types of copper sulphide deposits found at or near the contact of igneous with older rocks. It cannot be presented in the limits of a brief abstract, but the basal statement is "that the pyrrhotite segregations are deposited from a magma which contains little or no gaseous-liquid matter." W. F. HILLEBRAND.

Acidic Magmas, Their Exhalations and Residues. BY BLAMEY STEVENS. *Eng. and Min. J.*, 77, 351.—The hypothesis referred to in the foregoing notice is here extended to acidic magmas, both wet and dry, it being a first principle in the author's opinion that "all magmas are primarily wet, and dry magmas are formed only in regions of low pressure."
W. F. HILLEBRAND.

Report of a Geological Reconnaissance of the Iron Region of Angat, Bulacan. BY H. D. MCCASKEY. *The Mining Bureau Manila, Bull. No.* 3, pp. 62 ; maps, plates.—Tables of analyses of five medicinal waters (four sulphuretted, one ferruginous-bicarbonated), of iron ores and slag, limestones and clays, sandstone and diabase, accompany this report. With exception of the waters and assays of iron ores, which are taken from Spanish reports, all analyses were made by Paul L. Stangl in the Bureau of Government Laboratories, Manila. The method of iron smelting long practiced in the province has already been reviewed from an abstract in the *Iron and Machine World* (this Journal, **26**, R 95).
W. F. HILLEBRAND.

Geology of the Globe Copper District, Arizona. BY F. L. RANSOME. *U. S. Geol. Survey, Professional Paper No.* **12**, pp. 168; maps, plates.—The importance of this district now depends wholly upon its cupriferous ores, those of gold and silver no longer cutting any figure. The copper ores are simple in character and comprise both oxidized and sulphide salts of copper, the latter being both primary and secondary. Arsenical and antimonial minerals are unknown. The primary sulphide minerals are essentially pyrite and chalcopyrite, with less galena and sphalerite, and occasionally hübnerite, which occur in no regular paragenetic sequence. The gangue is altered country rock, or quartz, sometimes calcite. Chalcocite is the only sulphide of recognized secondary origin, forming films and shells on pyrite and chalcopyrite. The oxidized ores are hematite, limonite, cuprite, malachite, chrysocolla, and rarely azurite. "Cuprite, native copper, and hematite appear to be characteristic of the lower portion of the oxidized zone and probably tend in such a position to form first from the sulphides." But frequent exceptions to this rule are noted, for instance, malachite may form directly from chalcocite. Azurite, when it occurs, is of later origin than the malachite. "The process of sulphide enrichment appears to have worked downwards, keeping 200 feet or more in advance of distinct oxidation. Chalcocite thus occurs as residual masses in the oxidized ore, and as bunches in pyrite below the limit of oxidation." In greater depth the chalcocite will doubtless be found to decrease in amount. The ores occur in lodes, in masses in limestone, and as irregular mineralizations of shattered or permeable rocks. The second of the three types of occurrence affords the greatest abundance of ore. Accompanying the report are detailed analyses from the Survey laboratory of quartz-mica-diorites, quartz-monzonite, granitite, granite-porphyries, diabase, and biotite-dacite. W. F. HILLEBRAND.

A Reconnaissance in Northern Alaska across the Rocky Mountains along Koyukuk, John, Anektuvuk, and Colville Rivers, and the Arctic Coast to Cape Lisburne in 1901. BY F. C. SCHRADER. *U. S. Geol. Survey, Professional Paper, No.* **20**, pp. 139; maps, plates.—Contains analyses from the Survey laboratory of eight lignites and bituminous coals from the regions traversed. W. F. HILLEBRAND.

Diatom Earth in Arizona. BY W. P. BLAKE. *Trans. Am. Inst. Min. Eng.*, 33, 38–45.—The author has discovered extensive deposits of this earth in the central portion of San Pedro Valley, in the southwestern corner of Pinal County. The material is a fine volcanic dust or ash mingled with the diatom remains. Analysis by H. A. Mann showed: Ign., 5.07; Insol. (SiO_2), 82.81; Fe_2O_3, 1.10; Al_2O_3, 4.84; NaCl, 0.45; CaO, 2.10; MgO, trace; total, 96.37. Organic matter undetermined. The presence of organic matter in a layer of compact vitreous, hydrous silica—"opal silica"—in these beds, as in similar occurrences of California, has led anew to the idea of the possible diatomitic origin of bitumen and petroleum, an idea which is strengthened by Dr. Phillips' discovery (*Bull.* No. 5, Univ. of Texas) of petroleum globules in the substance of diatoms in Texas.
W. F. HILLEBRAND.

The Beaumont Oil Fields, with Notes on Other Oil Fields of the Texas Region. BY R. T. HILL. *J. Franklin Inst.*, 154, 143, 225, 263, and *Trans. Am. Inst. Min. Eng.*, 33, 363–405; figures.—Prepared originally as an address for the Franklin Institute. Near its close is presented the following tentative hypothesis to explain not only the mystery of Spindle Top, but also "the independent origin of the sulphur, sulphuretted hydrogen and gypsum, regardless of their association with the oil."

"The oil and salt pockets of the Texas Coastal Plain are probably not indigenous to the strata in which they are found, but are the resultant products of columns of hot saline waters which have ascended, under hydrostatic pressure, at points along lines of structural weakness, through thousands of feet of shale, sand, and marine littoral sediments of the Coastal Plain section, through which oil and sand are disseminated in more or less minute quantities. The oil, with sulphur, may have been floated upward on these waters, and the salt and dolomite may have been crystallized from the saturated solution. The channels of these ascending waters may have been in places of structural weakness, such as fissures, which probably at one time continued to the surface, but may have been sealed by the deposition of the later overlapping strata now capping the oil-pools. Such features, when occurring under gentle anticlines, may explain the collection of oil beneath the surface in pools.''

W. F. HILLEBRAND.

Catalogue and Index of the Publications of the Hayden, King, Powell, and Wheeler Surveys. BY L. F. SCHMEKEBIER. *U. S. Geol. Survey, Bull. No.* **222**, pp. 208.

W. F. HILLEBRAND.

ORGANIC CHEMISTRY.

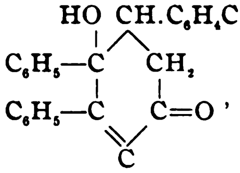
On Certain Addition-Compounds Derived from Orthobenzoquinone. BY C. LORING JACKSON AND HORACE C. PORTER. *Am. Chem. J.*, **31**, 89–119.—Tetrabrom-*o*-benzoquinone combines with various classes of compounds. Its combinations with water and alcohols are described in the present paper. By allowing the quinone to stand for some time at ordinary temperatures with alcohols or water (moist toluene or benzene was used), α-addition-products are obtained of the general type $(C_6Br_4O_2)_2ROH$. These are all white, crystallize in needles or prisms, and are decomposed by heat, yielding hexabrom-*o*-quinopyrocatechin ether, $C_6Br_4:O_2:C_6Br_2O_2$, as the principal product. By suitable treatment these α-compounds may be changed to the isomeric β-compounds. The latter form white polygonal plates, melt sharply without decomposition, and are remarkably stable toward heat, solvents, and many reagents. EXPERIMENTAL.—*Action of Methyl Alcohol on Tetrabrom-o-benzoquinone.* If the alcohol and the quinone are left in contact at the ordinary temperature the first substance formed is a red compound, which is changed by farther action of alcohol into the α-addition-compound, from which the β-addition-compound may be obtained by boiling for a few minutes with methyl alcohol. The *red substance* crystallizes from a mixture of benzene and ligroin in small, transparent, well formed prisms of a cherry-red color, m. p. 192°–193°, and on analysis gives figures corresponding to a formula, $(C_6Br_4O_2)_3CH_3OH$. The *α-Addition-Compound*, $(C_6Br_4O_2)_2CH_3OH$, crystallizes from warm benzene in short cream-white needles, and when heated quickly decomposes at 178°–182° It is quite unstable and begins to decompose slowly at 50°. The *β-Addition-Compound*, $(C_6Br_4O_2)_2CH_3OH$, crystallizes from a mixture of benzene and methyl alcohol in white rhombic plates, m. p. 261°. It is very stable toward hydrochloric, hydriodic (50 per cent.), sulphuric, or nitric acids, sodium hydroxide, aniline, or heat. Its *acetate*, $(C_6Br_4O_2)_2CH_3OCOCH_3$, crystallizes from a mixture of benzene and methyl alcohol in bunches of

or in prisms, m. p. 249°. The *α-Benzyl Alcohol Addition-*
d crystallizes from a mixture of benzene and ligroin in
less prisms or broad needles, and when heated rapidly
ses at 160°–170°, melting to a brilliant red liquid. Re-
ith zinc and acetic acid, it yields a substance which crys-
rom benzene in pale straw-colored needles, m. p. 273°–
ich is oxidized by nitric acid to a bright red substance
95°–300°), and is converted by the action of sodium ace-
acetic anhydride into a *tri-acetate*, m. p. 275°–280°. The
ion-Compound was obtained by treating the α-body with
hydride and fused sodium acetate and by action of sodium
on the α-body. It crystallizes in white polygonal plates,
6°–217°, and is very stable. The action of acetic anhy-
l sodium acetate upon the β-body at 120°–150° gives a
e, m. p. 208°–209°, which is apparently an acetyl deriva-
etra-brom-*o*-benzoquinone crystallizes from toluene with
of crystallization. The compound forms transparent
risms or large rectangular plates melting at 70°–75°.
ddition-Compound of Tetrabrom-o-benzoquinone and H_2O
es from benzene in colorless tapering flat needles, decom-
t 190°–200° when heated quickly, and melting to a bright
d. The *β-Addition-Compound* was obtained from the
y the action of acetic anhydride and sodium acetate. It
white crystalline compound, m. p. 221°–222°. *Certain*
s of α-Compounds Hydrochloric acid decomposes the
lcohol compound with formation of halogen, chloroform,
bstituted pyrocatechin ; the benzyl alcohol compound is
decomposed with formation of a free halogen, a benzyl
nd a substituted pyrocatechin ; the water compound
romine in considerable amount. Hydrobromic acid at
omposes the benzyl-alcohol compound, forming bromine,
nd benzal bromides and tetrabrompyrocatechin. Hexa-
uinopyrocatechin ether is formed by the action of sul-
cid upon the benzyl alcohol or water addition products.
Reactions of the β-Compounds: The methyl alcohol com-
s not changed by hydrochloric acid at 140°–160°; long
at 200° with hydrochloric acid chars it ; boiling 50 per
driodic acid or sulphuric acid (sp. gr. 1.38) does not alter
m acetic acid and tetra-brom-*o*-benzoquinone an *addition-*
d was obtained, probably belonging to the α-series, which
ed from glacial acetic acid in large yellow-white effores-
tangular plates or prisms, decomposing at 220°–230°.
m-*o*-benzoquinone crystallizes from cold acetophenone
tophenone of crystallization, in transparent red prisms,
at 50°–60°. When the quinone and the acetophenone
d together, tri-phenyl benzene (m. p. 171°) is formed.

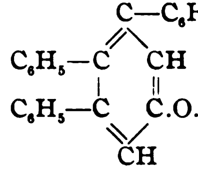
M. T. BOGERT.

Action of Alcohols on the Tetrazonium Chlorides Deriv from Benzidine and from o-Tolidine. BY J. H. C. WINSTON. *Am. Chem. J.*, 31, 119–142.—This paper deals especially with th action of methyl, ethyl and propyl alcohols, under different conditions, upon di-phenyl and *m*-ditolyl tetrazonium chlorides. *m*-Ditolyl tetrazonium chloride, decomposed with methyl alcohol, yields dimethoxy-*m*-ditolyl as the sole product; with ethyl alcohol, approximately equal amounts of diethoxy-*m*-ditolyl and *m*-ditolyl are obtained; with normal propyl alcohol the only product isolated was *m*-ditolyl; with a solution of sodium methylate in methyl alcohol, or with any of the above alcohols in the presence of sodium hydroxide or zinc powder, the "hydrogen" reaction alone takes place. When diphenyl tetrazonium chloride is decomposed with methyl alcohol, dimethoxydiphenyl is produced, together with a trace of diphenyl; with ethyl or normal propyl alcohols only diphenyl is formed; with sodium methylate in methyl alcohol solution, or with any of the above alcohols in presence of sodium hydroxide or zinc powder, only the "hydrogen" reaction takes place. EXPERIMENTAL.—*m*-Ditolyl-tetrazonium chloride was prepared by treating *o*-tolidine chloride with nitrous vapors, the clear solution thus obtained being added to 3 volumes of well-cooled 95 per cent. alcohol; when the tetrazonium chloride precipitates in yellow flocks which are filtered out, washed and dried. The yield was about 80 per cent. of the theoretical. When it was decomposed with methyl alcohol, dimethoxy-*m*-ditolyl was the only product, whether the reaction was conducted at room temperature or at the boiling-point of the methyl alcohol, and whether the alcohol was absolute or diluted. If the alcohol contained as much as 40 per cent. or 50 per cent. of water, the yield was considerably diminished and more tar formed. *Dimethoxy-m-ditolyl*, $C_{14}H_{12}(OCH_3)_2$, crystallized in silvery leaves, m. p. 145.5°. When the diazonium chloride was decomposed by ethyl alcohol at room temperature or boiling point of the alcohol, with absolute or diluted alcohol, approximately equal amounts of the diethoxy-*m*-ditolyl and *m*-ditolyl were obtained. If the alcohol was too dilute, the yields were less and the amount of tar greater. By the action of nitric acid upon these alkoxy-compounds tetranitroderivatives were obtained. *Tetranitrodimethoxy-m-ditolyl*, needles, m. p. 130.5°; *Tetranitrodiethoxy-m-ditolyl*, rhombs or needles, m. p. 142°. *m*-Ditolyl was very conveniently prepared by decomposing the tetrazonium chloride with zinc powder and methyl, ethyl, or *n*-propyl alcohols, the yield of the pure substance being 76 per cent. of the theoretical. Diphenyl-tetrazonium chloride was prepared in manner similar to that used for the tolyl compound, the pure chloride being obtained in nearly white needles. The yield was 85 per cent. of the theoretical. When decomposed with methyl alcohol, yields of dimethoxydiphenyl amounting to 65 per cent. to 70 per cent. of the theoretical were ained, while with methyl alcohol and zinc dust the yield was per cent. *Tetranitrodimethoxydiphenyl*, $C_{14}H_{10}O_2(NO_2)_4$, from ethoxydiphenyl and fuming nitric acid, crystallized from hol in straw-colored needles, m. p. 244.6°. By the action of hol and zinc powder upon diphenyltetrazonium chloride, yields iphenyl amounting to 80–85 per cent. of the theoretical were ained, and the author regards it as the best method for the paration of diphenyl. M. T. BOGERT.

ome Δ_2-Keto-R-Hexene Derivatives. BY JAMES B. GARNER. . *Chem. J.*, 31, 143–153.—A study of the reactions which ht be brought about between benzoin and unsaturated aldeles, ketones and esters through the agency of cold sodium ylate, was begun by the author several years ago. Recently work has been extended to include the reactions between the ols-benzoin, cuminoin, furoin, anisoin, and piperonoin and the aturated ketones, benzalacetone, cuminalacetone, *p*-methoxyzalacetone, and piperonylenacetone. In all of these reactions, keto-R-hexene derivatives are formed, except when furoin is d. The latter does not react. In all other cases, the reions progress smoothly and excellent yields are obtained. place of the unsaturated ketone, a mixture of the correspond- aldehyde and acetone may be used, the reaction being comed at water-bath temperature and the yield is thereby inased. Instead of alcoholic sodium ethylate, 10 per cent. ium hydroxide solution may be used as a condensing agent, the yields are poorer. In the present paper only those eximents are reported which indicate, in a general way, (1) the ure of the products formed, and (2) the extent to which the ction is applicable. EXPERIMENTAL.—*I. Addition of Benzoin uminalacetone.* This results in the formation of *3,4-Diphenylmyl-4-oxy-Δ_2-keto-R-hexene*,



ich crystallizes from glacial acetic acid in long, fine, white dles, m. p. 231°, insoluble in ligroin, ether and cold alcohol, dissolving readily in hot benzene, glacial acetic acid, and oroform. Instead of cuminalacetone, a mixture of equal lecules of cuminol and acetone may be used. The *oxime* ms white crystals, m. p. 221°–223°, easily soluble in hot ohol, cold ether, acetic acid, and hot benzene, but very ringly soluble in hot ligroin (40°–60°). By boiling the keto-

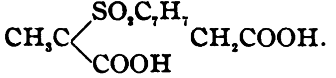


R-hexene derivative with excess of acetic anhydride or acetylchloride for thirty minutes, *3,4-diphenyl-5-cumylphenol acetate*, is produced. This crystallizes from ligroin (40°–60°) in long needles, m. p. 98°, soluble in cold glacial acetic acid, benzene ether, and alcohol but sparingly soluble in ligroin. By saponifying the acetate with alcoholic potassium hydroxide the free *3,4-diphenyl-5-cumylphenol* is obtained. It crystallizes from alcohol in white needles, m. p. 155°, readily soluble in cold chloroform, benzene, and ether, but sparingly soluble in hot ligroin. II. The *Addition of Benzoin to Anisylideneacetone* or to a mixture of equal molecules of anisaldehyde and acetone, yields *3,4-diphenyl-5-anisyl-4-oxy-Δ_2-keto-R-hexene* which crystallizes from glacial acetic acid or from absolute alcohol in bunches of needles, m. p. 233.5°. Its *oxime* melts at 196°. *3,4-Diphenyl-5-anisylphenol acetate* melts at 141°–142°. *3,4-Diphenyl-5-anisylphenol* melts at 159°–160° and with cold concentrated nitric acid gives nitro derivatives. *III. The Addition of Benzoin to Piperonyleneacetone* results in the formation of *3,4-diphenyl-5-piperyl-4-oxy-Δ_2-keto-R-hexene* and the reaction progresses more smoothly than when a mixture of equal molecules of piperonal and acetone is used instead of the piperonyleneacetone and the reaction carried out on the water-bath. The product crystallizes from glacial acetic acid in fine white glittering needles, m. p. 240°. Its *oxime* melts at 190°–191°. *IV. The Addition of Cuminoin to Benzalacetone* gives *3,4-dicumyl-5-phenyl-4-oxy-Δ_2-keto-R-hexene*, m. p. 214° in a yield of 27 per cent. of the theoretical. Its *oxime* crystallizes from a mixture of benzene and ligroin (40°–60°) in fine white needles, m. p. 208°. *3,4-Dicumyl-5-phenylphenol acetate* crystallizes from glacial acetic acid in bunches of long radiating fibers, m. p. 122°. *3,4-Dicumyl-5-phenylphenol* crystallizes from alcohol in large thin plates, m. p. 137°. In general, cuminoin reacts less readily than benzoin. *V. Addition of Anisoin to Benzalacetone.* Anisoin adds itself to the ethylene grouping much more easily than either cuminoin or benzoin, but the resulting 1,5-diketone does not lose water so readily and consequently forms the chief product of the reaction. The diketone was not separated in the pure state but its approximate melting-point was found to be 168°–174°. *3,4-Dianisyl-5-phenyl-4-oxy-Δ_2-keto-R-hexene* forms fine white needle-like crystals, m. p. 207°. Its *oxime* and *acetate* were also prepared.

M. T. Bogert.

Some Addition-Reactions of Sulphinic Acids. By Elmer P

KOHLER AND MARIE REIMER. *Am. Chem. J.*, 31, 163–184.—The authors have found that sulphinic acids combine more or less readily with aldehydes to unstable 1,1-oxysulphones, with α,β-unsaturated acids or ketones to stable sulphones with the sulphone group in the β position, which crystallize well and can be used to detect small quantities of unsaturated ketones. These sulphones are very sensitive to alkali which splits off the sulphinic acid and regenerates the unsaturated compound. This may explain why only 1,2-disulphones are easily hydrolyzed by alkalies. Ketones having two double linkages in the α,β-position add only 1 molecule of sulphinic acid giving thus an unsaturated sulphone. Ketones containing the grouping that Thiele has called "a conjugated system of vicinal double unions" add only 1 molecule, it going to the double union nearest the carbonyl, the sulphone to the β-position. Some facts were observed indicating that the preparation of symmetrical disulphones by action of sulphinic acids on unsymmetrical dihalogen derivatives takes place by the following steps: $CH_3CHBr_2 \xrightarrow{+RSO_2Na} CH_3CHBrSO_2R \xrightarrow{-HBr} CH_2 = CHSO_2R \xrightarrow{+RSO_2H} CH_2SO_2R—CH_2SO_2R$. EXPERIMENTAL.—*I. Addition of Paratoluenesulphinic Acid to Aliphatic Aldehydes.* The aldehyde was added in excess to an ethereal solution of the acid, the solution heated a short time and the addition compounds precipitated with ligroin. They were purified by re-solution in ether and reprecipitation by ligroin. Products were all unstable, losing the aldehyde slowly even in the cold. Sharp melting-points could therefore not be obtained. Acetaldehyde gave *1-paratolylsulphonethanol*, $CH_3CH.OH.SO_2C_7H_7$, thick plates melting poorly 52°–72°. Isobutylaldehyde gave *1-paratolyl-sulphone-3-methylpropanol*, $(CH_3)_2CH.CH.OH.SO_2C_7H_7$, colorless needles or thick plates. Heptoic aldehyde gave *1-paratolylsulphoneheptanol*, $CH_3(CH_2)_5CH.OH.SO_2C_7H_7$, fine white needles. *II. Action of Paratoluenesulphinic Acid on Aromatic Aldehydes.* Method same as above. The compound from benzaldehyde could not be obtained pure. In general, the compounds are more stable than those above, not changing in the air and crystallizable from alcohol, acetone, etc. *m*-Nitrobenzaldehyde gave *1-paratolylsulphone-1-metanitrophenylmethanol*, *m*-$NO_2.C_6H_4CH.OH.SO_2C_7H_7$, fine white needles, m. p. 110°. *p*-Nitrobenzaldehyde gave *1-paratolylsulphone-1-paranitrophenylmethanol*, *p*-$NO_2.C_6H_4CH.OH.SO_2C_7H_7$, pale yellow needles, m. p. 116°. This substance with acetic anhydride gave the acetal of paranitrobenzaldehyde; with aniline it decomposed giving the aniline salt of paratoluenesulphinic acid. *III. Addition of Paratoluenesulphinic Acid to Cinnamic Aldehyde* gave two substances, the *monosulphone*, $C_6H_5CH(SO_2C_7H_7)CH_2CHO$, m. p. 78°, and the *disulphone*, $C_6H_5CH(SO_2C_7H_7)CH_2CH(OH)SO_2C_7H_7$, m. p. about 126°, the second being also produced from the first by the action of a second molecule of the sulphinic acid. *IV. Addition of Sulphinic Acids to 1-2-Unsaturated Acids.* Paratoluenesulphinic Acid and Cinnamic Acid gave *β-Paratolylsulphonehydrocinnamic Acid*, $C_6H_5CH(SO_2C_7H_7)CH_2COOH$, white crystalline powder, m. p. 197°–198°, the same body being produced by action of sodium paratoluenesulphinate on β-bromhydrocinnamic acid. The sodium, calcium, and barium salts and the methyl ester (m. p. 156°) were prepared. Benzenesulphinic Acid and Cinnamic Acid gave *β-Phenylsulphonehydrocinnamic Acid*, $C_6H_5CH(SO_2C_7H_7)CH_2COOH$, shining plates, m. p. 173°. Barium salt and ethyl ester (m. p. 139°) prepared. Paratoluenesulphinic acid gave the same product with both fumaric and maleic acids. *β-Paratolylsulphonepropionic* acid, $C_7H_7SO_2CH_2CH_2COOH$, the same product being formed from β-iodopropionic acid and the sodium salt of the sulphinic acid, needles, m. p. 110°–113°. Paratoluenesulphinic acid and Citraconic acid gave *Paratolylsulphonepyrotartaric Acid* believed to have the structure,



$$CH_3C\begin{matrix} \diagup SO_2C_7H_7 \\ \diagdown COOH \end{matrix} CH_2COOH.$$

Stable small lustrous prisms, m. p. 169°–171°, with loss of carbon dioxide. Sodium salt, small white needles. *V. Addition of Paratoluenesulphinic Acid to Unsaturated Ketones.*—Benzalacetone gave a sulphoneketone (fine white needles) having the structure $C_6H_5CH(SO_2C_7H_7)CH_2COCH_3$, as is shown by its giving β-paratolylsulphonehydrocinnamic acid by treatment with bleaching powder. The sulphoneketone is stable toward dilute acids but easily decomposed by dilute alkalies. Phenylhydrazine decomposes, it giving phenylhydrazone of benzalacetone, phenylhydrazine salt of paratoluenesulphinic acid and 1,5-diphenyl-3-methyl pyrazoline. Dibenzalacetone gave a monosulphoneketone shown to have the structure $C_6H_5CH(SO_2C_7H_7)CH_2COCH = CH.C_6H_5$, fine needles, m. p. 189°. Benzalacetophenone gave a sulphoneketone, needles, m. p. 169°–170°. Cinnamylidenacetone gave a monosulphoneketone, structure $C_6H_5CH : CH.CH(SO_2C_7H_7)CH_2COCH_3$, m. p. 125°–126°. The sulphone group in this compound is in the β position, while according to Thiele's theory it should be in the δ position. Cinnamylidenacetophenone also gives an unsaturated monosulphoneketone, $C_6H_5CH : CHCH(SO_2C_7H_7)CH_2COC_6H_5$, needles, m. p. 145°.

V. J. CHAMBERS.

BIOLOGICAL CHEMISTRY.

The Relation between the Decomposition-Tension of Salts and Their Anti-Fermentative Properties. BY HUGH MCGUINAN. *Am. J. Physiol.*, 10, 444–452.—The determination of the minimum amount of salts, bases, and acids necessary to inhibit the action of malt diastase on starch shows the following relationships: In the different salts of the same acids the inhibitory power was found to vary inversely with the solution-tension of the cation. Salts containing cations of low solution-tension inhibit powerfully. This inhibitory power appears, therefore, to be determined by the ease with which the cation gives up its positive charge. In the different salts of the same metal, the inhibitory power was found to vary inversely with the solution-tension of the anion. Salts of ions, such as the hydroxyl and iodide, of low solution-tension, inhibit more powerfully than the chlorides, with a high tension. The inhibitory power of the cations is also inversely proportional to the heat of the ionization. The inhibiting power of any salt is inversely proportional to he sum of the solution-tension of its ions, or to the decom-osition tension of the salts. F. P. Underhill.

The New Biologic Test for Human Blood, with a Report of ts Employment in a Recent Murder Case. By A. Robin. *N. Y. Med. J.*, 79, 433–440 and 500–502.—The conclusions drawn rom this report are: Human blood can be distinguished from hat of other animals, except, perhaps, monkeys by means of ntiserum. Antiserum may be obtained by immunizing rabbits gainst human blood. For immunization six to eight injections f 8–10 cc. each of human placental blood should be made at in-ervals of three to five days and the serum secured at least a week fter the last injection. Control tests on blood from different omestic animals should invariably be made. With all pre-cautions observed, a distinct clouding within thirty minutes and precipitate within two hours is certain evidence that the blood s human. F. P. Underhill.

The Influence of Hydroxyl and Hydrogen Ions upon the Regeneration and Growth of Tubularians. By Jacques Loeb. *Arch. f. d. gesammte Physiol.*, 101 340–349.—The results of the esearch show that in neutral solutions of sodium chloride, potas-ium chloride, calcium chloride and magnesium chloride in the proportions in which these salts are contained in sea-water, there esults a regeneration of the polypes excised from tubularians, but that the regeneration and growth in these solutions is much lower than that which takes place in sea-water. If to this solu-ion of chlorides a small quantity of sodium bicarbonate or di-odium hydrogen phosphate be added, the growth may be greatly accelerated and made comparable to that in sea-water. Since addition of sodium hydroxide behaves in a similar manner, one gains the impression that an acid that inhibits growth if not neu-ralized may be formed in the polypes of the tubularians. Certain algae under the influence of light appear to eliminate substances that give an alkaline reaction to neutral solutions, and they may help to keep the reaction of sea-water nearly at the neutral point. F. P. Underhill.

Changes in the Viscosity of the Blood Produced by Various Experimental Procedures. By R. Burton Opitz. *Proc. Soc. Exp. Biol. and Med.*, December 16, 1903.—If distilled water (5–50 cc.) be injected intravenously, the viscosity of blood is increased. Under similar conditions injections of normal sodium chloride solutions leads to a small viscosity of the blood. Concentrated solutions of dextrose (5 cc.) increase viscosity, but this disappears in a half hour. Subcutaneous injections of curare give a greater viscosity to the blood. Alcohol (3–5 cc. of 10 and 25 per cent. solutions) injected intravenously increases the viscosity. The same result is obtained when alcohol is introduced into the stomach and duodenum. The specific gravity of blood is in direct ratio to the viscosity. F. P. Underhill.

The Use of Formaldehyde as a Preservative in Urine. By Frank W. Kenney. *N. Y. Med. J.*, 79, 403–405.—Formaldehyde as an artificial ingredient of the urine will lead to deceptive results in urine analysis by (*a*) making urine appear albuminous when it is negative and (*b*) not giving a typical reaction when present. The reliability of Qutrona's test, namely, the use of formaldehyde in albuminous urines as a reagent, is to be questioned, inasmuch as the effect of formaldehyde on negative urine is the same as that on albumin in solution.

F. P. Underhill.

The Comparative Digestibility of Raw, Pasteurized and Sterilized Milk. By T. M. Price. *N. Y. Med. J.*, 79, 405–407.—The animal employed was the calf. It was fed first raw, then pasteurized and finally sterilized milk, and the percentages of the milk digested expressed in terms of protein and fat were determined. The results show that the digestive coefficients are slightly in favor of the raw milk. Sterilized milk, instead of causing constipation, had the opposite effect.

F. P. Underhill.

Further Experiments on the Influence of Various Electrolytes on the Tone of Skeletal Muscles. By W. D. Zoethout. *Am. J. Physiol.*, 10, 373–378.—The hydroxides of sodium, potassium, ammonium, barium and strontium cause an increase in the tone of skeletal muscle. This increase in tone is abolished by sodium, lithium and magnesium chloride solutions. If the increase in tone is produced by a weak solution of the hydroxide $\left(\frac{m}{100}\right)$, the salts of calcium, strontium, and barium also reverse the action. If the concentration of the hydroxide is greater than $\frac{m}{100}$, the calcium, barium and strontium salts cause a further shortening of the muscle. The carbonates of sodium, potassium and lithium, are very similar to the hydroxides in their action on the tone of skeletal muscles. F. P. UNDERHILL.

The Alloxuric Bases in Aseptic Fevers. BY ARTHUR R. MANDEL. *Am. J. Physiol.*, **10**, 452–458.—The results of this investigation show that the incomplete products of tissue metabolism, such as the alloxuric bases, are important factors in the production of the febrile temperature. F. P. UNDERHILL.

On the Morphological Changes in the Blood after Muscular Exercise. BY P. B. HAWK. *Am. J. Physiol.*, 10, 384–401.—The normal blood count for healthy young men taking regular physical exercise was as follows: Red corpuscles 5,600,000 per cubic millimeter, and leucocytes 8,800 per cubic millimeter, the ratio between leucocytes and red corpuscles being 1 : 636. The muscular exertion incident to running, walking, bicycle-riding, and swimming invariably caused an immediate increase in the number of red corpuscles per cubic millimeter and an accompanying leucocytosis. The increase in the number of red corpuscles produced by muscular exercise is due primarily to the passage into the circulating blood of a large number of cells lying in various parts of the body and inactive before the time of bodily exercise. The leucocytosis is due to the changed distribution of the leucocytes and their accumulation in the peripheral circulation.

F. P. UNDERHILL.

Effects of Certain Salts on Kidney Excretion, with Special Reference to Glycosuria. BY ORVILLE HARRY BROWN. *Am. J. Physiol.*, **10**, 378–384.—Solutions $\left(\frac{m}{8}\right)$ of sodium chloride, sodium citrate, sodium acetate, and sodium sulphate produce diuresis, and also a glycosuria. The diuresis is not the cause of the glycosuria, for by the addition of small amounts of calcium or strontium chloride, the glycosuria is prevented while the diuresis still persists. Calcium and strontium chlorides likewise decrease or inhibit the excretion of sugar which is caused by the injection of phlorizin. It is assumed that the anions stimulate the renal activities and the cations depress them.

F. P. UNDERHILL.

The Relation of Ions to Ciliary Movement. BY RALPH S. LILLIE. *Am. J. Physiol.*, **10**, 419–444.—Pure solutions of sodium salts act destructively on cilia, producing liquefaction and cessation of movement. Potassium and ammonium salts, on the contrary, permit movement to continue for some time. This destructive action of sodium salts is not prevented by the addition of other anions to the solution. The majority of cations exhibit antitoxic action, that is, prevent liquefaction and enable movement to continue. Antitoxic action appears thus to be a function of the electrical positivity of the cation. The antitoxic efficiency of the cation varies with its valence, trivalent ions (aluminum, chromium, and iron) exhibiting their most favorable action at concentration from 16 to 32 times less than those found necessary for most bivalent ions. Monovalent ions (except hydrogen) require higher concentration than bivalent ions for the production of antitoxic effects. The heavy metal cations exhibit varying antitoxic efficiency ; in general, this is greater with metals of high solution-tension. The order of antitoxic efficiency corresponds somewhat closely with the order of the metals in the solution-tension scale, indicating that a relation exists between physiological activity of an ion and the "fixation-intensity" of its charge or charges. In dilutions of $\frac{m}{6,400} - \frac{m}{12,800}$ the hydrogen ion exhibits well-marked antitoxic action. The quantity of a given cation required to counteract the toxicity of a salt is found to increase with an increase in the valence of the anion of that salt.

F. P. UNDERHILL.

PHARMACEUTICAL CHEMISTRY.

1. Adulterated Drugs and Chemicals. BY LYMAN F. KEBLER. *U. S. Dept. of Agr., Bur. of Chem., Bull.* 80.—That there is much truth in the oft-repeated statement that drugs and chemicals are grossly adulterated is beyond question. The members of the pharmaceutical profession are quite generally, though many times unjustly, held responsible for this deplorable condition. While some of them do resort to questionable or even reprehensible practices and wilfully adulterate their goods, they alone are not responsible for all of the adulteration that exists. The market is supplied with "bleached ginger," "limed nutmegs," "silvered cochineal," and many other drugs of similar character, which have been treated to ward off the attack of insects, to cure the kernels, or to improve the appearance of the drug. Bleached ginger results from coating the fingers with calcium carbonate. This appears to be done in the process of curing ; it appears also to be done to conceal inferior quality. Only about 5 per cent. of coating is added, but there is an increase of about 15 per cent. in the price. Cochineal, because of its high price, is very frequently adulterated with the exhausted drug, talcum, earthy matter, or with a paste so moulded as to simulate the insects. Various methods for detecting a spurious article are given. The ash from normal cochineal should not exceed 6 per cent. One gram of cochineal is boiled with an aqueous solution of potassium hydroxide and diluted to 100 cc. The color produced by 10 cc. of this solution diluted to 400 cc., is taken as an arbitrary color standard and called 100. As the amount of carmine varies even n good samples, such a standard would likewise vary. For this eason 12.5 cc. of N/100 potassium permanganate solution is liluted to 100 cc. which gives a tint of color identical with that rom pure cochineal obtained as just outlined, and this is used as he standard. By comparing the tinctorial value of samples under xamination with this standard, the quality of the cochineal may e rapidly ascertained.

Many accidental impurities are met with in drugs, and it is ometimes difficult to draw the line between these and fraudulent dulterations. Some of these impurities consist of twigs, stems, lirt, foreign leaves, pebbles and many other bodies, amounting in ome cases to 20 per cent. of the weight of the drug. Their resence is excused on the plea that some drugs are collected by gnorant, semicivilized people who cannot be expected to remove uch extraneous matter. A sample of golden seal root was found o leave 23.8 per cent. of ash, indicating the presence of about 13 er cent. of earthy matter. Chimaphilla leaves have contained 25 per cent. of stems, jaborandi leaves 16 per cent. of twigs and stems, cocoa leaves 18 per cent. of foreign material, and a sample of cubeb berries, 15 per cent. of stems, 11 per cent. of worthless berries and only 6.38 per cent. of oil.

Because drugs deteriorate upon keeping is no reason why they should be sent out by the drug miller as of prime quality, nor is it a reason why the manufacturer of galenical preparations should use them.

It is stated by reliable authorities that it is virtually impossible to make absolutely pure chemicals. Many of the chemicals on the market are marked "C. P." although containing several per cent. of various other chemical substances. The designation "C. P." as at present applied is worthless and misleading, as even the poorest of chemicals are occasionally so labeled by some manufacturers. Many examples which have come under the writer's observation are cited to sustain this contention. More recently some manufacturers have labeled their pure chemicals as "free from manganese," "free from sulphur," "arsenic free," or "strictly chemically pure." This is regarded as a step in the right direction, as for special purposes a chemical may answer perfectly well even if it does contain traces of foreign chemicals, as long as it does not contain manganese, sulphur or arsenic.

Analyses are given of a number of samples of oils of bay, coriander, pimento and of potassium cyanide. While some of them complied with pharmacopoeial requirements, others did not. The potassium cyanides examined contained from 22 to 73 per cent. of sodium cyanide, from 0.7 to 12.8 per cent. of potassium carbonate, and as high as 14 per cent. of sodium chloride. Calculated for potassium cyanide these proved to be from 95 to 111 per cent. pure.

The principal motive of intentional adulteration is pecuniary gain. With this end in view borax is mixed with sodium bicarbonate, corn starch is sold for arrowroot, 25 per cent. of all of the oil of turpentine bought in small amounts is liberally diluted with kerosene, chloroform is used to increase the specific gravity of a questionable sandal wood oil, beeswax is adulterated with cassava starch, while one sample was found to consist of Japan wax, ceresin and some flavoring material.

Instances are given where samples of prime drug were submitted with bids, but where a greatly inferior quality was sent upon receipt of an order. Thus, a sample of belladonna leaves was found by assay to contain 0.438 per cent. of total alkaloids, while the consignment, consisting of nine bales, showed the following percentages of total alkaloids: 0.12, 0.14, 0.11, 0.10, 0.13, 0.12, 0.13, 0.30, 0.11. Other equally deceptive transactions are recorded. Many manufacturers recognize this deplorable condition of affairs and are anxious to have them remedied, but do not see their way out on account of the existing keen competition. W. H. BLOME.

II. Rose Geranium Oil and Its Substitutes. BY LYMAN F. KEBLER (cf. above).—In spite of the great advances made in the knowledge of volatile oils, it is still very difficult for the chemist to detect adulterations. A table shows the result of the analysis of thirteen samples of oil. Of these, three are unquestionably adulterated. The writer suggests that a well-developed sense of smell is at present the most satisfactory means of judging the quality of geranium oil. W. H. BLOME.

III. Phenacetin: Methods of Analysis and Commercial Status. BY LYMAN F. KEBLER (cf. reference above).—A detailed history of the work done on phenacetin and the successful methods employed in its preparation from the earliest workers down to the present time is recited. A copy of the letters patent granted to O. Hinsberg with an interpretation of their meaning is also given.

The author reviews briefly the principal physical and chemical tests for the purity and identity of phenacetin, including the melting-point, solubility, Hirschsohn's bromine water test, the saponification and subsequent color reaction test with sodium hypochlorite solution with its several modifications, Plugge's mercurous nitrate test, iodophenol test and the isonitril test. Attention is called to the fact that much smuggled or "peddled" phenacetin is sold in this country, and several of such samples are reported as adulterated. W. H. BLOME.

Progress in Pharmacy. BY M. I. WILBERT. *Am. J. Pharm.*, **76**, 129.—Achroin is an aromatic liquid preparation given in doses of 0.25 gram in capsules as a genito-urinary disinfectant.

Tschirch and Schmidt have examined Australian turpentine, and port that they have found it to contain 25 per cent. of laricopinic id, an amorphous body having the formula $C_{22}H_{30}O_8$; 34 per nt. of laricopinonic acid, crystalline, having the formula $_{10}H_{28}O_4$; 35 per cent. of an essential oil, specific gravity 0.872, nd boiling between 154° and 164° C; 2 per cent. of indifferent sene; and 3 or 4 per cent. of undetermined impurities.

Bismutose is stated to be a yellow colloidal bismuth albuminate. consists of 21.7 per cent. of bismuth, 3.3 per cent. of chlorine, nd 68 per cent. of albumen, the remaining 7 per cent. being water. he compound is made by mixing a filtered solution of bismuth trate in common salt solution with an aqueous solution of egg bumen. The gelatinous mass is washed with hot water, expressed, dried and powdered.

Bismuth oxyiodo-agaricinate is a gray, insoluble, amorphous owder, intended to be used like bismuth subgallate as an astringent antiseptic. It is also used internally for gastric and intestial ailments.

Eumydrin, which is atropine methyl nitrate, is a white, odoress, soluble powder. It acts as a mydriatic and, classified accordng to its action, may be placed between homatropine and atroine.

Exodin is a new aperient. It is sold as a yellow, insoluble powler and is said to be a derivative of oxy-anthra-quinone. Dose is rom 1.0 to 1.5 grams.

Iboga is a Congo plant, having properties similar to both coca and kola, due to an alkaloid named ibogaine. The latter causes anesthesia like cocaine, and acts upon the medulla like kola.

Iodterpin is made by mixing equal parts of iodine and terpin hydrate, and heating gently. It is a thick viscid liquid and has been suggested as a substitute for iodine and iodoform.

The price of artificial musk has fallen in Germany from 1900 to 125 marks per kilo. While its odor is quite similar to that of the natural product, they are by no means identical chemically or in physiological action.

Ponticin is a new, white, crystalline glucoside from *Rheum rhaponticum* and *R. undulatum*. Upon hydrolysis it yields dextrose and pontegenin.

Rhomnol is a nucleinic acid obtained from the thymus gland of calves.

Salibromin is a white, unctuous powder, containing 44.5 per cent. of salicylic acid and 51.6 per cent. of combined bromine. It is used in the treatment of rheumatism in doses of 0.5 to 1.5 grams.

The following is said to be a soluble adrenaline powder: Adrenaline 0.05, citric acid 0.10, and boric acid 4.85 grams. One centigram of this powder is equivalent to 10 drops of a 1 : 1000 solution.

Subcutine is the name applied to the paraphenol sulphonate of para-amino-benzoic ethyl ester. It consists of small white needles, is not decomposed by boiling, and is a powerful, quite harmless, local anesthetic.

Trigemin is made from butyl chloral hydrate and pyramidone, and is used in migraine and facial neuralgia. W. H. BLOME.

INDUSTRIAL CHEMISTRY.

The Oil Industry of California. BY G. C. T. DEANE. *Eng. Min. J.*, January 7, 1904.—In 1900, California consumed 4,000,000 barrels of oil; in 1901, 8,000,000 barrels; in 1902, 13,692,514 barrels. All railroads and street-car lines, and most of the machine shops are now using oil exclusively. The electric light and gas companies use oil and the price of gas has fallen one-third since it has been used in its manufacture. There are 40 refineries now in operation and the Standard Oil Company has completed an eight inch pipe line 278 miles long, which carries the oil to their largest refinery. The oil-bearing territory of California runs from the extreme southern part of the State to within a few miles of San Francisco. The most important section is the Kern River district. Here there are 4,000 acres of proved land, with oil sand to a depth of 400 feet. There are said to be few wells that do not produce 100 barrels a day the year through—there are many that have produced an average of 250 barrels a day for two years. In the Kern River district oil is selling at the well at 20 cents a barrel; the cost of pumping is said to be not over 3 cents per barrel.

There are four buyers of oil in California. The Standard Oil Company which owns no wells, the Associated Oil Company owning about half the wells in the Kern district, and two-thirds of the wells in McKittrick, the Southern Pacific Railroad, and the Union Oil Company.

The Standard Oil Company is able to set the price. As there is ample chance to make money at present prices, figures are not likely to go up unless there is a cessation of work on new wells.

About 16 tons of this oil (or 104 barrels) give the same horsepower as 25 tons of the best coal. The evaporation per pound of coal is 9.17 pounds at 212° F.; under the same condition the evaporation per pound of oil is 15 pounds at 212° F. Therefore, the ratio of oil to coal is 1.65 to 1.

There are at present nearly 200 vessels arriving and departing from San Francisco, using oil, and almost all the ferry, bay, and river boats use oil. One ferryboat now uses 143 barrels of oil in forty-eight hours, which formerly used 40 tons of coal to do the same work. At 70 cents a barrel for oil and $6.00 a ton for coal this would effect a saving of 58 per cent. S. P. SADTLER.

Bromine. BY JOSEPH STRUTHERS. *Eng. Min. J.*, January 7, 1904.—The production of bromine in the United States during

1903, including the quantity of bromine in potassium bromide, amounted to 603,500 pounds, valued at $172,000, as compared with 513,890 pounds, valued at $128,472, in 1902. The bulk of the bromine came from Michigan, the balance coming from salt wells in West Virginia, Ohio and Pennsylvania. The average price for 1903 was 28½ cents per pound. More than one-half of the bromine produced comes from Michigan, and in that state the chief producer is the Dow Chemical Co. Of the amount of bromine furnished by Michigan, 270,000 pounds came in the form of potassium bromide and 56,500 pounds as liquid bromine.

S. P. Sadtler.

Sulphur. By Joseph Struthers. *Eng. Min. J.*, January 7, 1904. The production of sulphur in the United States during 1903 is estimated at 13,500 short tons, valued at $262,175, as compared with 8,336 short tons, valued at $220,560, in 1902, and about 185,796 long tons imported in 1903. The most of this came from the mines of the Union Sulphur Co., near Lake Charles, Calcasieu Parish, La., the balance coming from the mines of the Utah Sulphur Co., in Beaver County, Utah, and those of the Nevada Sulphur Co., at Rabbit Hole Springs, Humboldt County, Nev. This amount constitutes about 6 per cent. of the total sulphur used in this country for the manufacture of sulphuric acid, and 2½ per cent. of the total sulphur used in this country in 1903, including that contained in pyrites. S. P. Sadtler.

AGRICULTURAL CHEMISTRY.

Soil Treatment for Peaty Swamp Lands, Including Reference to Sand and "Alkali" Soils. By C. G. Hopkins. *Ill. Agr. Expt. Sta. Bull.* 93, pp. 273-303.—Peaty swamp lands occupying immense areas in Northern Illinois, have been found deficient in potassium but rich in the other elements of plant food. On such soils, producing no corn or only 5 bushels per acre, the application of potassium for two years increased the yield to 45 to 66 bushels in one experiment, and to 67 to 73 bushels in another experiment. Reports from farmers showed an increase in the yield of corn of more than 30 bushels per acre due to the use of potassium. The application of nitrogen to a sand ridge soil (a kind of peaty swamp soil) increased the yield of corn from about 30 to more than 60 bushels per acre. A preliminary investigation of the so-called "alkali" soils or spots, showed commonly an excess of magnesium carbonate associated usually with much larger quantities of calcium carbonate. Notes are given on the sources and use of potassium, and on the soil survey work in the state.

H. W. Lawson.

Reply to an Address on the Present Status of Soil Investi-

gation. By F. K. Cameron. *Science*, **19**, pp. 343–347.—This is in reply to the address of Dr. Hopkins (R., **26**, p. 126) in which the methods and conclusions published in Bulletin **22** of the Bureau of Soils were severely criticized. H. W. Lawson.

Studies in Soil Bacteriology. By F. D. Chester. *Del. Agr. Expt. Sta. Rep.*, 1902, pp. 46–78.—Studies of the variations in the number of bacteria in soils, the effect of stirring and pulverizing soil on its bacterial content, the effect of mineral fertilizers on the development of soil bacteria, the predominating bacteria in a soil sample, and the nitrogen-assimilating bacteria in soils are reported. H. W. Lawson.

Potash Fertilizers. By H. J. Patterson. *Pa. Dept. Agr. Bull.* 117, 45 pp.—This is a general discussion of the sources and methods of application of potash fertilizers, including a history of the use of potash in agriculture, a discussion of the rôle of potash in plants, a description of potash salts and of other potash fertilizers, a summary of the results of experiments which have been conducted with potash fertilizers, and notes on injurious and indirect effects of potash salts.

H. W. Lawson.

Soils, Waters, Foods, Fruits, Etc. By E. W. Hilgard *et al.* *Cal. Agr. Expt. Sta. Rep.*, 1901–1903, pp. 23–103.—The several articles grouped for convenience under this heading include discussions of a number of subjects, and analyses of numerous samples of soils, waters, feeding-stuffs, breakfast foods, almond pastes, prunes, commercial alkalies, etc. The humus in the soils of the arid region of Oregon was found to be low in quantity but rich in nitrogen, while the soils of the humid region contained a high percentage of humus poor in nitrogen. Studies are reported on the distribution of alkali in California soils, and preliminary plans and estimates for the drainage of the Fresno district are given, with a discussion of the benefits of drainage especially in connection with the reclamation of alkali lands. The examination of 275 samples of water was made with reference to their fitness for domestic and irrigation purposes. The sugar content of the fresh fruit of sugar prunes varied from 13.7 to 20.53 per cent. The sugar content of the standard French prune averaged 18.5 per cent. Lemon juice which had been in an aluminum vessel was found to contain 0.35 part of aluminum and 0.28 part of tin per 10,000, showing a slight action of the citric acid on the metal container. Grain under salt water for 14 months was considered of greater value for feeding than for fertilizing purposes. The increase of soluble matter in bread by toasting was studied, the conclusion being drawn that the beneficial effects of toasting are not due to an increase in the solubility of the ingredients or to sterilization, but may be due to a stimulating action of the flavor upon the process of digestion. The seeds of *Polygala apopetala* were found to contain 56.5 per cent. of oil, which is more liquid and less drying than olive oil. It is not considered likely that this plant can be grown with profit for oil production.

H. W. LAWSON.

The Available Energy of Timothy Hay. BY H. P. ARMSBY AND J. A. FRIES. *U. S. Dept. Agr. Bureau of Animal Industry Bull.* 51, 77 pp.—This is presented as a report of progress upon experiments with the Atwater-Rosa respiration calorimeter modified to meet the requirements of domestic animals. The work was done with a steer at the Pennsylvania Experiment Station, and is believed to afford the first actual determination of the heat production of an agricultural animal. The experiment proper was preceded by a trial to determine the digestibility of the hay used. The results are discussed as regards the digestibility of the rations, the metabolizable energy or the energy of food minus the energy of excreta, and the net available energy or the metabolizable energy minus the energy required in digestion and assimilation. The results are not regarded as sufficiently exhaustive to warrant positive conclusions, and such deductions as are made are expressly stated to be tentative only. Rubner's law of isodynamic replacement of nutrients was not found to be entirely applicable to herbivorous animals with their large expenditure of energy in digestive work. With the ration below that of maintenance, only 63 per cent. of the metabolizable energy served to prevent loss of tissue, the 37 per cent. simply increasing heat production. Under the conditions of the experiment the digested matter of the hay was therefore not isodynamic with body tissue. The difference is ascribed to the relatively large expenditure of energy necessary in the digestion and assimilation of the hay. The maintenance requirement of cattle is therefore considered a question of tissue replacement rather than of heat production and is a variable rather than a constant, depending upon the availability of the energy of the feeding-stuffs used, coarse feeding-stuffs like hay requiring more energy in the work of digestion and assimilation than material like corn meal, and thus leaving less energy available for the maintenance of tissue.

H. W. LAWSON.

Results of Investigations at the Sugar Experiment Station Laboratory for 1903. BY C. A. BROWNE, JR. *Lousiana Planter and Sugar Manufacturer*, 32, (1904), pp. 47–51.—This is a brief résumé of investigations relating to the insoluble carbohydrates of the sugar cane, composition of the fiber of sugar cane and its utilization in paper-making, enzymes of the sugar cane, changes in the composition of sugar cane during ripening, fermentations of cane juice, methods of extraction and clarification, and the composition of molasses feeds. In studying the so-called gums of sugar-cane, xylan, araban, and galactan were separated and identified. Pentoses prepared from cane consisted of about 4 parts of xylose and one of arabinose. Galactan was present only in small quantities. In normal juices from Louisiana cane the gums constituted usually less than 0.2 per cent. Analyses are given of the pith, fibrovascular bundles, and rind of sugar cane, and an improved process of manufacturing paper from the pith is noted. Analyses are also given of the juice from different parts of immature cane and from whole cane cut at different periods of growth. The enzymes found in the sugar cane were diastase, invertase, oxidase, and a reductase or catalase. It is suggested that the oxidizing enzymes may serve to protect the plant from invasion by fungi and bacteria. Several fermentations of cane juice due to different micro-organisms are noted. Gelatinous hydroxides from the mineral monazite possessed no advantage in clarifying juice over other gelatinous hydroxides, such as that of aluminum, which has been discarded in sugar manufacture.

H. W. LAWSON.

The Growth of Crimson Clover. BY C. L. PENNY. *Del. Agr. Expt. Sta. Rep.*, 1902, pp. 79–84.—Determinations were made of the fertilizing constituents in the roots and tops of crimson clover at different stages of growth. H. W. LAWSON.

Change in the Composition of Growing Peaches. BY C. L. PENNY. *Del. Agr. Expt. Sta. Rep.*, 1902, pp. 87–88.—Analyses of the twigs, buds, blossoms, and fruit of peaches at different stages of growth. H. W. LAWSON.

Examination of Commercial Peppers. BY J. W. GLADHILL. *Am. J. Pharm.*, **76**, pp. 71–81.—Thirteen different kinds of pepper were examined, determinations being made of ash, ether extract, piperine, and oleoresin. It is concluded from the results that the ash should not exceed 6.5 per cent. for black pepper and 3 per cent. for white pepper, that the ether extract should be between 7.5 and 10 per cent. for black pepper and 6 and 9 per cent. for white pepper, and that piperine should be present in from 5.5 to 9 per cent. in good black pepper. H. W. LAWSON.

Some Rare Fixed Oils. BY G. R. PANCOAST AND W. GRAHAM. *Am. J. Pharm.*, **76**, pp. 70–71.—Determinations of the specific gravity, acid number, and saponification number of the following oils are reported: Walnut, hazelnut, hickory nut, lobelia, strophanthus, pumpkin, larkspur, nux vomica, and ergot.

H. W. LAWSON.

PATENTS.

SEPTEMBER 29, 1903.

740,040. Max Perkiewicz, Ludwigsburg, near Moschia, Germany. Making **bricks.** The bricks are coated before burning with a solution of gelatine, flour and aluminum sulphate to harden them.

740,072–3. Wm. J. Armbruster, St. Louis, Mo. **Pigments.** In the first, molecular equivalents of sodium, barium, and zinc sulphates are mixed together and the precipitate collected; in the second, zinc sulphide and sulphate and barium carbonate are brought together.

740,099. Silas C. Davidson, Birmingham, Ala. **Building block.** Earthy matter 85, coal tar 15, for the body and a face of sand 70, and rosin and color 15 parts each.

740,131. John A. Heany, Philadelphia, Pa. **Insulated wire.** Covered first with a bath of adhesive as glue, then with flocculent asbestos, then with glue and kaolin or alumina, so that it cannot burn from heat generated within or without.

740,176. James R. Phillips and Charles W. Bray, Pittsburg, Pa. **Rolling black plates.** The sheets are coated with sulphate of copper before rolling.

740,188. Adolph Seigle, Lyons, France. **Building material.** Calamine is calcined, mixed with lime and sand 90 per cent., moistened to make a paste, molded, pressed and steamed at a pressure of 6 to 8 kilograms.

740,283. George Klenk, Hamburg, Germany. **Tannin extracts.** The crude tannin solution is treated first with aluminum sulphate and then with sodium bisulphite, then heating it in a closed receptacle to 125° C. and a pressure of two to three atmospheres.

740,355. Hans von Dahmen, Vienna, Austria-Hungary. Assignor to Josef Fuhrere, same place. **Detonating composition.** Potassium nitrate 45, potassium bicarbonate 30, sulphur 16, aluminum 9 parts, granulated and pressed into wafers two millimeters thick.

740,364. Lucius R. Keogh, Hamilton, Canada. **Making alumina,** etc. Sulphates of iron and aluminum are mixed with sodium chloride and water, the mixture heated with carbon in the presence of steam, the product is lixiviated and the sodium sulphate crystallized out, the sodium aluminate and iron sulphide precipitated, and the sodium carbonate recovered.

740,372. Charles Rogers, Kew, Victoria, Australia. Assignor to Alice Mary Oswald, Caulfield, Australia. **Extracting zinc** from sulphide ores. The ore is roasted and thrown hot into water by which it is leached, sulphuric acid being added, the exhausted ore is subjected to a second roast, releached with the same liquor, and the process repeated till all zinc is extracted.

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740,424. Robert G. Groppler, Berlin, Germany. **Disinfecting soap.** Formaldehyde solution is mixed with soap, the whole melted and cooled. The soap is in excess.

740,465. Alcide F. Poirrier, Paris, France. Assignor to St. Ame des Matières Colorantes, St. Denis, Paris, France. **Black dye.** A substituted diphenylamine is caused to react on an aromatic sulphur chloride, the ratio of amino to hydroxy substitution groups being at least 2 : 1.

740,468. Christopher Ris and Albert Mylius, Basle, Switzerland. Assignors to Anilin Color and Extract Works, same place. **Acridine dye.** A formyl aromatic base is melted with a metadiamine compound and a basic salt. Brown powders soluble in water and alcohol orange with green fluorescence, insoluble in ether and benzene, dyeing tannin mordanted cotton and leather orange to brown shades.

740,519. Frida Brandner, Brooklyn, N. Y. **Beverage.** Coffee beans are sprayed with alcohol, roasted, ground, and soaked in an alcoholic liquor, in which they are allowed to stand, sugar and water added and the whole filtered.

740,539. John M. Cutler, Ukiah, Cal. **Quicksilver furnace.** Two concentric cylinders are arranged with the smoke stack of the inner rotating cylinder extending through an ore bin, the furnace at the other end leading into the inner cylinder, and a fume pipe from said inner cylinder along the smoke stack to the outer air.

740,628. Jurgen Callsen, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. **Alkyloxyalkylidene ester of salicylic acid.** The ethoxyethylidene ester is a yellowish liquid soluble in ether, chloroform, benzene and alcohol, the latter colored violet by ferric chloride and decomposing by dilute acids into salicylic acid, acetaldehyde and ethyl alcohol.

740,636. Max Engelmann, Elberfeld, Germany. Assignor to Elberfeld Co., New York, N. Y. Monoformyl derivative of **1-3-dimethyl 2-6-dioxypyrimidine.** The monoformyl derivative of 3-methyl-2-6-dioxy-4-5-diamino pyrimidine is treated with methyl chloride and caustic soda and the product isolated by filtration and recrystallization.

740,678. Edwin A. Moore, Philadelphia, Pa. **Ammonia still.** A column still in which there are three sets of openings in the diaphragms, capped risers on one side, large central tubes that are both drops and risers, and drops only on the opposite side.

740,697. Robert Scannell, Cleveland, Ohio. **Metal polish.** Carmine 1, oxalic acid 6, common salt 64, water 40, and tripoli 160 parts by weight.

740,700. Gustav A. Schutz, Wurzen, Germany. Utilization of **furnace gases.** Pass the gases through an alkaline lye and, when carbonated, evaporate; the steam and CO_2 are used to furnish power, then separated and the CO_2 recovered.

740,701. Amedee M. G. Sebillot, Paris, France. **Sulphide ores.** Sulphuric acid heated to its boiling-point is applied to the ore, and simultaneously recovered, the sulphated ore roasted at 700° C., and then lixiviated. The Cu is recovered as cement copper, the ferrous sulphate calcined and sulphuric acid recovered.

740,702. Bruno R. Seifert and Frederich R. Engelhardt, Radebeul, Germany. Assignors to Chemische Fabrik von Heyden, same place. **Sodium acetyl salicylate.** A neutral white powder, insoluble in ether and benzene, soluble in cold water, the solution not giving a violet color on adding ferric chloride.

740,767–8. August L. Laska, Offenbach-on-Main, Germany. Assignor to K. Oehler, Anilin und Anilin Fabrik, same place. **Blue black mordant dyes.** For the first diazotized-*p*-nitraniline-*o*-sulphonic acid is combined in acid solution with 2-5 aminonaphthol-7 sulphonic acid, and the resulting azo dye combined with diazotized picramic acid in alkaline solution, forming gray-black powders soluble in concentrated sulphuric acid, claret-red, in water violet, turning bluer on adding soda-lye. The second combines in acid solution diazo-β-naphthylamine 3-6 disulphonic acid with 2-5-aminonaphthol-7-sulphonic acid for the first component.

740,778. John E. Prestwich, Farnworth, England. **Treating yarn.** The yarn is placed on an open reel, and enclosed in a cylinder which is filled with spirit dye, the reel rotated, the dye removed, heat applied to vaporize the remainder, and then cooled to condense said vapor before opening the vat.

740,832. Friedrich Elias, Philadelphia, Pa. Assignor to the Biogen Co., New York, N. Y. **Zinc peroxide.** Barium peroxide is mixed with water and strained and the fine portions treated with zinc chloride.

740,855. Carl H. von Hoessle, Radebeul, near Dresden, Germany. Assignor to Chemische Fabrik von Heyden Aktiengesellschaft, same place. **Mercurous chloride.** A colloidal calomel being a gray powder soluble in water, the solution opalescent, of neutral reaction, insoluble in alcohol and ether, and precipitated by acids.

740,994. Benjamin F. Schwier, Cleveland, Ohio. **Grindstone.** Shale 50, grit sand 30, fire-clay and jollie clay 10 parts each molded and burned in a kiln.

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741,029. Richard Gley and Otto Siebert, Berlin, Germany. Assignors to Aktien Gesellschaft für Anilin Fabrikation, same place. **Red azo lake.** Aminobenzene-*o*-sulphonic acid is diazotized and combined with β,β-hydroxynaphthoic acid, and the product united with a metallic salt to form a red lake.

741,030. Richard Gley, Berlin, Germany. Assignor to Aktien Gesellschaft für Anilin Fabrikation, Berlin, Germany. **Green sulphur dye.** The indophenol, $NH_2—C_{10}H_6—C_6H_4—OH$, is heated with alkali polysulphides in the presence of copper. A dark green powder, insoluble in water, slightly soluble in concentrated sulphuric acid, bluish and in alkali sulphides and caustic alkali easily soluble green, and dyeing unmordanted cotton green.

741,041. Max H. Just, New York, N. Y. **Coffee substitute.** Lupinen (a glucoside) and figs 2 parts each and lupins and malt 3 parts each.

741,047. Bernhard Klepper, Brooklyn, N. Y. **Removing sound records.** A mixture of turpentine 100, wax and spermaceti 1 part each is applied to the surface of the cylinder or tablet to soften it, and wax is worked in to make a smooth surface.

741,185. James T. Taylor, Houston, Texas. **Nailing brick.** Portland cement and coke 1 part each, and sand $2^1/_2$ and cinders 5 parts.

741,227. George D. Coleman, Boston, Mass. Assignor to Coleman Ship Coppering Co. **Antifouling ships paint.** The surface is coated with quick drying paint; finely divided copper is projected therein, and then burnished and additional finer copper added till a smooth surface of metallic copper is made.

741,228. **As above** except that the metallic copper is mixed with the paint.

741,243. Wm. M. Grosvenor, Edgewater Heights, N. J. Assignor to General Chemical Co., New York, N. Y. **Sodium acetate.** Materials containing sodium sulphate and calcium acetate in excess are mixed and heated, filtered and sodium carbonate added to the liquid and again filtered, the liquid concentrated to dryness and fused, the resultant solid dissolved and the sodium acetate crystallized out in successive portions, this operation being repeated, and the salt purified by sulphuric acid.

741,256-7-8. Wm. A. Lawrence, New York, N. Y. Assignor to Continental Rubber Co., Jersey City, N. J. **Extracting gum.** In the first, disintegrated rubber plants are treated with a hydrocarbon to dissolve the gum and resin, a part of the solvent evaporated, the remainder treated with sodium hydroxide to separate the gum. In the second patent, an elastic apron surrounds a wheel adapted to rub and disintegrate the material between the wheel and apron, and the third is for the process of obtaining gum by frictional disintegration.

741,259-60. **As above,** for the alkaline solution of resin and naphtha got from rubber-bearing plants, and the second for refining this mixture by adding alcohol, evaporating the alcohol and naphtha together, the resin being drawn off as a by-product, and the two solvents condensed at a temperature such that they form two layers, the naphtha being removed as a by-product and the alcohol pure enough for re-use.

741,274. Albert R. Pritchard, Rochester, N. Y. **Electroplating apparatus.** The cathode consists of two sheets to be plated fastened together back to back, so that the coating is deposited on one side only, of each sheet.

741,297. Anton von Benst, Orange, N. J. **Printing compound.** Glycerol, anilin color and glue 3 parts each, soap 1, carbolic acid a few drops, melted together and molded to a roll.

741,396. Guillaume de Chalmot, Leaksville, N. C. Assignor to the Wilson Laboratory Co., New York, N. Y. **Nitrogen compounds.** A compound of titanium, lime and carbon is heated in an electric furnace through which nitrogen is passed, whereby titanium and calcium nitrides are formed, in place of cyanides or carbides, and then exposing the nitrides to superheated steam to form ammonia.

741,439. Charles E. Baker and Arthur E. Burwell, Cleveland, Ohio. **Chlorinating ores.** Ores containing a base metal and a metalloid are chlorinated in a revolving cylinder and heated enough to vaporize the chlorine from the metallic chlorides. Ores of nickel, copper and iron are treated as above, the metallic chlorides dissolved out, converted into sulphates, the copper electrolyzed, then neutralizing the solution and electrolyzing the nickel with less current than sufficient to deposit iron. The nickel may be converted into a double oxalate.

741,517. Thomas Macalpine, Chiswick, England. Assignor to Alcohol Syndicate, London, England. **Refining mineral oil.** The oil is treated with a saturated solution of common salt and sodium carbonate, air being constantly blown through and then distilled over manganese dioxide.

741,552. Franz Scholl, Hochst-on-Main, Germany. Assignor to Farbwerke vormals Meister Lucius und Bruning, same place. **Azo dye.** Diazotized orthoaminophenol derivatives are made to react on 1-8-aziminonaphthalene-4-sulphonic acid in an alkaline solution.

741,554. Robert C. Schupphaus, Brooklyn, N. Y. **Pyroxylin compound.** Methyl isobutyl oxide or a similar compound ether is used as a solvent.

741,584-5. Oscar Liebreich, Berlin, Germany. The first for fatty substances, made by uniting an excess of fatty acids as stearic acid, or compounds containing fatty acids 100 parts with 20 parts of aromatic bases as aniline, forming mixtures of anilides of the fatty acids with the excess of the acids. The second for glycerin and acidulated derivatives of aromatic bases. Mixtures of fats, as tallow, are heated with an equivalent or excess of the aromatic base, as aniline to 200° C. for twelve to twenty hours, and the glycerol distilled off, the boiling-point of the fatty amide formed being higher than that of the glycerol.

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741,615. Johann G. Behrens and August Behrens, Jr., Bremen, Germany. **Acetic acid.** One part concentrated acetic acid and one-fifth part sulphurous acid are added to one-half part acetate of lime, as much more sulphurous acid and calcium acetate, and distilling off the acetic acid.

741,637. Herbert H. Dow, Midland, Mich. Assignor to Dow Chemical Co., same place. **Bromine from brine.** Untreated brine is divided into two parts, both are oxidized separately and simultaneously, and the products of oxidation of the first part are used to oxidize the second or another part. The bromine is removed by air blast which carries the bromine into an alkaline carbonate, and the remainder of the bromine is absorbed in the other portions of the brine.

741,653. Solomon Ganelin, Berlin, Germany. Treating **lead, silver or zinc ores.** The ores, if not oxides, are roasted, mixed with molten double chloride of zinc and sodium, the melt run off from the slag, cooled, leached and filtered. The precipitate contains the metallic oxides, the filtrate the double salt which is recovered for re-use. The metal of the metallic salt must be more basic than the metal to be recovered. The oxides are electrolyzed or otherwise treated to recover the metal.

741,712. Edwin C. Pohle, and Stuart Croasdale, Denver, Colo. Assignors to Metal Volatilization Co., Philadelphia, Pa. Treating **refractory ores.** The ore, sulphur and an alkaline haloid are mixed in proportions adapted to make a metallic haloid and an alkaline sulphate, the mixture roasted in free air at 900° C., and volatilizing the metallic haloid which is recovered from the fumes. Applied to silicious silver, lead or copper ores.

741,726. Richard A. Sembdner, Porz, Germany. **Lampblack.** Tar is fed into a rotating furnace at 572° to 752° F., and is gradually conveyed to the outlet, the light hydrocarbons burning away from the pitch at the mouth of the furnace, and the lampblack being collected at the mouth of the furnace as it rises therefrom.

741,728. Rudolph J. Schimper, St. Paul, Minn. **Fuel briquettes.** Charcoal 2000, starch 25, potassium nitrate and sodium carbonate 1.5 parts each.

741,734. Hermann H. Spohn, Boston, Mass. Assignor to Carter Ink Co., Boston, Mass. **Ink.** A nigrosine base 9 is dissolved in toluidine 45, and the mixture combined with equal parts of rosin oil and coal tar as a fixing agent.

741,769. George D. Coleman, Boston, Mass. Assignor to

Coleman Ship Coppering Co., of Maine **Paint.** A coat of red lead, drying oil and varnish is first applied then a coat of finely divided wood mixed with lead, and finally a coat of fine comminuted copper is applied and pressed into the paint.

741,840. Joseph Savelsberg, Papenburg, Germany. **Extracting heavy metals.** Sulphur ores are suspended in a solution of calcium chloride containing iron oxide, chlorine is blown into the mixture together with air, acid added to precipitate material unacted on, and the chlorides decomposed by electrolysis, the metal being recovered and the chlorine applied to other fresh material.

741,864. Meyer Wildermann, London, England. **Electrolysis of alkaline salts.** The decomposing cell is separated by a deep mercury seal from the combining cell, the alkali metal is deposited on the mercury, the amalgam is forced under the rib of the seal into the combining compartment where it rises by its own buoyancy and is decomposed by local action.

741,936. Erhardt Schleicher and August Dorrer, Ludwigshafen-on Rhein, Germany. Assignors to Badische Anilin und Soda Fabrik, same place. **Violet disazo dye.** 1-5 Dihydroxy naphthalene and 2 molecules of diazotized naphthionic acid are combined; the dye dissolves violet in water and on reduction with stannous chloride and hydrochloric acid yields diamino dihydroxynaphthalene.

742,072. Peter Schreck, Pittsburg, Pa. **Refrigerator lining.** The base layer is paint, rosin and cement, a middle layer is applied of cement, potter's clay, whiting, alum and sand, and an outer layer of varnish.

742,109. Paul Wurtz, Hoboken, N. J. **Molding material.** Keen's cement 7, ground asbestos 2, infusorial earth and *caput mortuum* (red iron oxide) each 0.5 part by volume.

742,124. Albert L. Martin, Clinton, Iowa. Assignor to Alonzo C. Tenney, same place. **Vegetable gelatine.** Irish moss is boiled, strained, boiled again and dried and shredded.

742,127. Martin H. Miller, Wiarton, Canada. Making **sugar.** Metallic electrodes are rotated beneath the surface of the juice, while a current is passed, filtered and subjected again to the current while passing through a fine metal framework, and treated with sulphurous acid gas while hot.

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742,174. Carl D. Ekman, Northfleet, England. **Adhesives.** Starch is treated with less than its own weight of 50 per cent. sulphuric acid at ordinary temperature, till sugar begins to form, then neutralizing the product and purifying it.

742,189. Richard Herz, Frankfort-on-Main, Germany. Assignor to Leopold Cassella and Co., same place. **Blue sulphur dye.** *p* Aminotolyl-*p*-oxychlorphenylamine is heated with polysulphides, forming a blue powder nearly insoluble in water or alcohol, easily soluble dark blue in concentrated sulphuric acid or aqueous alkaline sulphides from which it dyes unmordanted cotton green-blue shades.

742,212. Armand Muller-Jacobs, Richmond Hill, N. Y. Assignor to himself, Catherine Muller-Jacobs and John George de Styak and Harold Barnes Roberts, Pelham, N. Y. **Water-proof fabric.** The goods are saturated with sodium stearate and sodium bicarbonate and then passed through a solution of aluminum chloride and acetic acid.

742-224-5-6. Ernest S. Peck, and Walter M. Scott, Newburg, Ohio. Treating **garbage.** The material is cooked in a closed air-tight receptable by radiant heat under a vacuum, the liquids and solids separated, the grease taken from the liquid which is evaporated to stick and then mixed with the solids.

742,289. Alex Clarke, Paris, France. **Cattle food.** Peat is dried and pulverized, then mixed with glacial phosphoric acid 35 per cent. rice, and barley 1 to 3 parts, the whole thoroughly mixed, dried and pulverized.

742,322. Henty S. Hopkins, Bainbridge, N. Y. **Dried milk.** The butter-fat is taken from fresh milk, the milk dried to a powder, the butter kept melted for some time and then added to the dried skimmed milk.

742,340. Florentine J. Machalske, Brooklyn, N. Y. **Carbon chlorides.** A mass of broken carbon is charged in an electric furnace on a mixture of an alkali chloride and silica, the whole brought to incandescence by the current and the chlorine liberated is passed through the molten mass producing a carbon chloride.

742,341. Joseph Miller and Frank M. Ashley, New York, N. Y. Assignors to Isaac L. Miller, Paterson, N. J. **Ozonator.** An inner cylinder provided with trumpet-shaped ends that connect with the ends of a larger outer cylinder and air-pump and electrical connections, with band-like electrodes on the ends of the inner cylinder.

742,351. James I. Pittman, Longwood, Fla. **Turpentine still.** A steam-jacketed still with condensing coil and water supply is mounted on a wagon, all complete.

742,354. Joshua Ramsdell, Sprinfigeld, N. Y. Assignor to Thomas C. McClure, New York, N. Y. **Photographic printing surfaces.** A half-tone is made and all parts not required for one tint stopped out with opaque pigment removable by washing then a print is made for each tint, the rest of the picture being stopped out successively and a separate printing plate made from the separate parts of the picture thus formed.

742,405. Arthur Eichengrun, Elberfeld, and Julius Precht Hanover, Germany. Assignors to Farbenfabriken Elberfeld Co.

N. Y. **Photographic plates.** The ordinary gelatine bromide plate is treated first with an aqueous solution of the hydrochloride of *o*-amino-*o*-oxybenzylic alcohol and then with acetone bisulphite and dried. These plates are developed by alkali only.

742,411–2. Alexander M. Gow, Pittsburg, Pa. Assignor to George Westinghouse, same place. Apparatus and process for making **gas.** A body of fuel is brought to incandescence in a gas producer and the heat of the products of combustion stored in a stove, steam is injected into the incandescent fuel to make water-gas, and a current of gas already made is sent through the gas producer to carry off the volatile portions of a fresh charge. The resulting gases are all mixed.

742,429. Carl H. Von Hoessle, Radebeul, near Dresden, Germany. Assignor to Chemische Fabrik von Heyden Actien Gesellschaft, same place. **Colloidal soluble mercurous iodide.** An orange-colored powder of neutral reaction insoluble in alcohol and ether, soluble in water and colloidal. Obtained by mixing albumose 5, potassium iodide 2, water 300 parts. Dissolve and add mercurous nitrate 3, water 100, dialyze, and dry at low temperature.

742,430. Fritz Hoffmann and Otto Bonhoeffer, Elberfeld, Germany. Assignors to Farbenfabriken Elberfeld Co., New York, N. Y. Process of making **trichlorisopropyl** alcohol. Methyl halogen is made to react on ethyl ether and magnesium, and the mixture applied to chloral, then the product is decomposed, and the trichlorisopropyl alcohol isolated by dilute acid and distillation *in vacuo.*

742,441. Henry Johnson, Brunswick, Victoria, Australia. Assignor to Wm. Frier, Glenferrie, Victoria, Australia. **Steel making plant.** A melting furnace is placed at the top of an incline, this furnace feeds into a converter lower down, the converter into a regenerative open-hearth furnace placed over a Whitworth stove, whereby all the processes are made continuous with ease.

742,442–3. Woolsey M. Johnson, Hartford, Conn. **Electrolytic process and apparatus.** Four tanks are arranged stepwise, the next to the lowest being the depositing vat in which the solution is maintained under pressure sufficient to remove all occluded gases.

742,469. Carl H. Meyer, Zwickau, Germany. Assignor to Louis Blumer, same place. **Soluble starch.** The starch is heated in the presence of 1 per cent. of a volatile organic acid as formic acid, to 215° F., the acid vapors distilled, and the product further heated to 240° F.

742,502. Max Schroeder, Hamborn, Germany. Assignor to New Jersey Zinc Co., New York, N. Y. Contact process for

sulphuric acid and anhydride. Sulphuric anhydride an oxygen are separated from furnace gases and purified, then le over contact material, and the extra heat generated transferred to the incoming gases.

742,530. Eduard Ullrich and Victor Fussganger, Hochst-on-Main, Germany. Assignors to Farewerke, vorm. Meister, Lucius und Bruning, same place. **Printing black.** Fibrous materia is dyed with a diphenylamine derivative, which is then oxidized on the fiber, it is fast to turning green by air, to sulphurous acid, alcohol, benzene and ether, etc.

742,532. Hermann Vieth, Ludwigshafen-on-Rhein, Germany. Assignor to Knoll and Co., same place. **Cotarnine phthalate.** Phthalic acid reacts on cotarnine, forming a yellow micro-crystalline powder, fusing at about 102° to 105° C., and decomposing easily on recrystallization into an acid salt and free cotarnine.

742,797. Martin Moest, Hans Hertlein, and Ehrich Oppermann, Hochst-on-Main. Assignors to Farbwerke, vorm. Meister Lucius und Bruning, same place. **Electrolysis of organic compounds by titanium compounds.** The titanium compounds are added to the electrolytic bath in which nitro compounds are to be reduced to amino compounds as nitrobenzene to aniline, 3 to 6 amperes per m^2 being used. WILLIAM H. SEAMAN.

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INORGANIC CHEMISTRY.

Notice on the Composition of Bredig's Silver Hydrosol. By . C. Blake. *Ztschr. anorg. Chem.*, 39, 69.—In Bredig's method f forming silver hydrosols by means of an electric arc, with the ilver electrodes under water, the current is frequently broken by he rapid erosion of the electrodes. When this takes place, we ave simply an electrolyte conducting a current. In order to exlain these facts, that the anode is affected as much as the athode, that the solution becomes alkaline, and that the black recipitate which falls down seems to be an oxidation product of ilver, Blake studied the effect of an ordinary lighting circuit 120 volts) on electrodes of pure silver in pure water. He finds hat the anode loses weight, and that clouds of silver hydroxide(?) nd later of silver peroxide are formed, making the solution alkaine. Further, when alcohol is used in place of water, no effect s observed before the arc is made and this is done, only black silver hydrosol is formed without erosion of the anode.

This seems to prove that in Bredig's method of forming hydrosols of silver, silver compounds are formed in addition to the colloidal silver, in the way described. It is of importance in the study of the catalytic action of colloidal silver, especially in neutral or acid solution, to take into consideration these basic salts.

H. I. Schlesinger.

Conduct of Red Colloidal Gold Solution toward the Electric Current and Electrolytes. By J. C. Blake. *Ztschr. anorg. Chem.*, 39, 72.—It is well-known that when colloidal gold solutions are subjected to the influence of an electric current, they are coagulated and precipitated ; red colloidal gold solutions turn blue during this treatment. Blake found that when his colloidal solutions (made from an ether solution of gold chloride and a water solution of acetylene containing ether) were acted upon in a beaker by the current, no effect is produced, except when the concentration of the hydrochloric acid liberated becomes such that chlorine is formed by electrolysis. In a U-tube, however, migration of the gold particles is noticed. Upon breaking the circuit, the gold sinks from the cathode, leaving a clear solution. The solution about the anode changes color, becoming finally a light red. In the bend of the U-tube a red cloud settles, which, however, gradually dissipates, but if taken from the solution at once and dissolved in water, gives a pure, red colloidal gold solution. Experiments performed with an asbestos plug below the anode make it possible to analyze the results more sharply. They lead to the belief that all the gold particles are primarily negative and move therefore to the anode. There they lose their charge, but being unable for some reason to cling to the electrode, move away from it with an acquired positive charge. They meet negative particles which are moving to the anode, and combine with these forming the red cloud in the bend of the U-tube. The compound seems to be of an unstable character, as shown by its disappearance after a short period of time.

The second part of the paper deals with the effect of electrolytes upon colloidal gold solutions. There are five phenomena to study: (1) (2) the coagulation and the precipitation of the red colloidal gold solution; (3) (4) the coagulation and the precipitation of the blue colloidal gold solution; (5) and the change of the red into the blue. Tables are given showing that the effect is due to the basic radicals of the electrolyte and also that the higher the valence of the negative radical, the less electrolyte is required to change the red to blue. (The precipitation begins immediately after this change takes place.) These facts agree with Whetham's hypothesis; the facts that the change is sharp, and that the effect of a mixture of electrolytes with basic radicals of different valence is subtractive rather than additive, on the other hand, seem not to favor this hypothesis.

The dielectric ether was shown to be a hindrance to the reaction, since the dilution of the ether solution with water hastened the change. The effect of electric currents, both direct and alternating, is not completely worked out—in some cases it hastens the change and in others makes it slower. The author promises to work out these influences, as well as other points connected with the five phenomena mentioned.

H. I. SCHLESINGER.

Minerals Containing Radium in the Province of Quebec. By J. OBALSKI. *Eng. and Min. J.*, March 17, 1904.—About ten years ago the author found a rock containing uranium in mining in Quebec. He had this analyzed recently by Dr. Rutherford, and found that it was as rich in radium as ordinary pitchblende. He found also in coal bearing veins a small quantity of uranium and radium. He intends to investigate this further.

H. I. SCHLESINGER.

Graphitic Acid or Oxide. BY F. S. HYDE. *J. Soc. Chem. Ind.*, March 31, 1904.—The author reviews several methods of preparing the yellow graphitic acid ($C_{11}H_4O$) and the green graphitic oxide. Staudenmeier's method of preparing the acid by oxidizing expanded graphite (Brodie's form) consists in oxidizing this graphite at 20° by means of crude concentrated sulphuric and nitric acids (sp. gr. 1.4), and dry potassium chlorate stirred in gradually. This after treatment with permanganate gives the green oxide, which is then treated with a solution of permanganate and dilute sulphuric acid, and finally with hydrogen peroxide.

The author prefers a combination of Berthelot's and Staudenmeier's methods, described by Fitzgerald. This consists essentially, of using a mixture of potassium chlorate and red fuming nitric acid (using small quantities in a test-tube) to obtain the green oxide and then proceeding as before. Different forms of graphite give varying results, Ceylon graphite of 90 per cent. purity yielding the best results. Apparently the more perfect the graphitization the more readily is the graphitic oxide formed. It is evident that differences in structure of the graphite are accompanied by differences in behavior toward oxidizing agents.

It has been suggested to use the chlorate oxidizing mixture to distinguish graphite from other forms of carbon. The author believes that in general only approximate separations can be made in this way and that especially in the case of hard gas retort carbon the results are unsatisfactory. H. I. SCHLESINGER.

On Double Halogen Salts. BY H. L. WELLS. *Am. Chem. J.*, 31, 395.—Ephraim believes that he has discovered three laws regarding double halogen salts. "It is his opinion that the number of molecules of positive metal halide which are capable of combining with a negative halide is greater: (1) When the atomic weight of the positive halide is smaller; (2) When the atomic weight of the negative halide is greater; (3) When the atomic weight of the halogen is smaller."

Wells shows that the first law is neither new nor general in its application. Wells and Foote had announced a similar rule, and had later shown that it did not apply to the sodium and thallium double fluorides and zirconium. Ephraim is further criticized adversely for rejecting without sufficient ground the formula for the complicated (23 : 10) alkaline-antimonious halides.

H. I. SCHLESINGER.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

On a New Nepheline Rock from the Province of Ontario, Canada. BY FRANK D. ADAMS. *Am. J. Sci.*, 17, 269–276.—Eastern Ontario presents "one of the most extensive and interesting developments of nepheline-bearing rocks which are known to occur anywhere." The present rock represents an entirely new type, that of Order 8 (Ontarare) of the peralkalic persalanes of the Quantitative System of Classification. Analysis afforded Mr. M. F. Connor the following results: SiO_2, 39.74; TiO_2, 0.1[illegible]; Al_2O_3, 30.59; Fe_2O_3, 0.44; FeO, 2.19; MnO, 0.03; CaO, 5.7[illegible]; MgO, 0.60; K_2O, 3.88; Na_2O, 13.25; CO_2, 2.17; SO_3, trace; Cl, 0.02; S, 0.07; H_2O, 1.00. Total, 99.86. These place the rock in Rang 2 (domalkalic), Subrang 4 (dosodic), for which the names monmouthase and monmouthose, respectively, are proposed, while monmouthite may be used as an ordinary designation. The calculated strikingly abnormative mode is: Albite, 1.83; nepheline, 72.20; sodalite, 0.28; cancrinite, 5.14; hornblende, 15.09; hematite, 0.50; calcite, 3.12; pyrite, 0.14. Total, 98.30. Water, 0.50. Excess of Al_2O_3, 1.20.

W. F. HILLEBRAND.

Note on a Calcite-Prehnite Cement Rock in the Tuff of the Holyoke Range. BY B. K. EMERSON. *Am. J. Sci.*, 17, 277–27[illegible]. —This "is made up in about equal parts of calcite in shapeless areas with very irregular boundaries, and a colorless prehnite in coarse rudely radiating prisms and wheel-shaped forms . . . ." together with a few blades of biotite, which may be secondary and of distinctly secondary angular fragments of acid plagioclase and microcline (Sp. gr. 2.86). It encloses small angular pieces of trap.

W. F. HILLEBRAND.

On the Classification of Sedimentary Rocks. BY A. W. GRABAU. *Am. Geol.*, 33, 228–247; figures.

W. F. HILLEBRAND.

Osmosis as a Factor in Ore-Formation. BY H. P. GILLETTE. *Trans. A. I. M. E.*, New York Meeting, October, 1903. 5 pp.—The author would make osmosis the chief factor in ore deposition and the latter to result simply from separation of dissolved substances from solutions as they cool without in any way invoking the aid of chemical precipitation. More than one statement of the author's is open to criticism, and his confusion of mind is perhaps best illustrated by the evident fact that he regards osmotic pressure and rate of diffusion as identical. Incidentally it may be noted that his calculated value for the osmotic pressure of sugar in solution is erroneous, because based on the formula $C_{11}H_{22}O_{11}$ for sugar instead of $C_{12}H_{22}O_{11}$.

W. F. HILLEBRAND.

Original Native Gold in Igneous Rocks. BY R. W. BROCK. *Eng. Min. J.*, 77, 511.—The author refers to several notices in recent volumes of the Canadian Geological Survey of the occurrence of gold as an apparently primary constituent of igneous rocks in British Columbia.

W. F. HILLEBRAND.

Free Gold in Igneous Rocks of Southeastern Russia. By . H. Weed. *Eng. Min. J.*, 77, 522.—The author gives an stract of an important monograph by J. Morozewicz, dealing th the above subject, and thinks the origin of the gold and ver found may be accounted for by an application of the mag- .tic exhalation hypothesis of Vogt. W. F. Hillebrand.

Contributions to Economic Geology, 1903. By S. F. Emmons d C. W. Hayes, Geologists in charge. *U. S. Geol. Survey, ll. No.* 225, 527 pp.—This, the second report of its kind (see s Review 25, R300), "contains 51 contributions from 37 mem- s of the Survey who have been engaged more or less contin- usly throughout the year in economic work, together with brief tements by the geologists in charge of the section of metallif- us ores and the section of non-metalliferous economic minerals, the extent and character of the economic work being carried in the Survey." Some of these papers have already appeared full and been noted in this review. Others have little or no ect interest for the chemist. Numerous analyses appear at es, many of them new, particularly in the papers treating of ls, shales, clays, and cement resources.

W. F. Hillebrand.

A Preliminary Report on the Clays of South Carolina. By rle Sloan. *South Carolina Geol. Survey, Series IV, Bull.* 1, +111 pp.; plates.—This report is replete with analyses, both emical and rational, and there are the results of many pyro- tric tests as well. The analyses were made mainly in the oratory of Clemson College, the physical tests and a part of analyses in the author's private laboratory.

W. F. Hillebrand.

Reported Gold Deposits of the Wichita Mountains. By H. Fos- r Bain. *Senate Document No. 149, 58th Congress, Second Ses- n,* 10 pp. Washington, Government Printing Office.—The de-spread belief among the people of the Wichita Mountains, Ok- oma, and adjacent regions, that the mountains held stores of cious metals, led to the careful collecting of over 70 samples d their assay by Dr. E. T. Allen in the laboratory of the U. S. ol. Survey. In no case was a trace of gold found; in only two ten samples tested was silver present. It is concluded "that ne of the prospects examined shows any ore in the proper sense the term, and that none has any present or probable future lue." W. F. Hillebrand.

Mineral Resources of the United States, 1902. 1038 pp. By avid T. Day.—In this bound volume a number of the reports e found to be less detailed than the originals as they appeared the form of advance extras during the past year. Many of em have already been noticed in this review.

W. F. Hillebrand.

The Menominee Iron-bearing District of Michigan. By W. S. Bayley. *U. S. Geol. Survey Monograph*, **46**, 513 pp.; maps, plates.—This is the last of a series of six monographs treating of the iron-bearing districts of the Lake Superior region. The mineral constituents of the richer ores are: Hematite, magnetite, muscovite, serpentine, dolomite, apatite, pyrite, quartz, and manganese oxide, all of which are found also as visible masses either in veins cutting the ore bodies or in vugs or pores within them. The processes of concentration were the same as in the Gogebic and Marquette districts. "Oxygenated meteoric waters descending through the rocks of the Hanbury and Vulcan formations dissolved iron carbonates and silicates and precipitated the metal as oxide in or near the position of the original compounds. Carbon dioxide was thus liberated and dissolved in the descending waters. These took up more iron salts. In their downward passage they were converged into trunk channels by plunging synclines, or were directed into definite courses by the contact planes between adjacent beds or by zones of brecciation. At these places the iron-bearing waters, which necessarily must have taken circuitous routes, were intermingled with water which had descended more directly from the surface, and which, therefore, had retained its oxygen, or most of it. Here the dissolved iron carbonate was decomposed and iron oxide precipitated. Thus are found pseudomorphs of hematite in place of original ferruginous concretions, and great deposits of ore in the troughs of synclines within the iron-bearing formation. Continued passage of water along the same channels purified the deposits by removing from them deleterious substances." Analyses are numerous, both by chemists of the survey and others. W. F. Hillebrand.

The Rôle of Possible Eutectics in Rock Magmas. By Alfred C. Lane. *J. Geol.*, **12**, 83–93; plate.—From a study of a recent paper by Iddings, entitled "On the chemical composition of igneous rocks expressed by means of diagrams" (This Journal, **26**, 1289), the author is led to take issue with Professor Iddings's statement regarding his general diagram, that it shows no clustering of analyses and no natural subdivisions. The author believes that "Iddings' diagrams do suggest a natural grouping and classification based on the various eutectics of various magmas," but that the time is not ripe for a permanent arrangement, because we know as yet too little about the eutectics.

W. F. Hillebrand.

ANALYTICAL CHEMISTRY.

A New Method for the Determination of Free Lime and of So-Called "Dead Burnt" Lime. By Edward H. Keiser and S. W. Forder. *Am. Chem. J.*, **31**, 153–162.—The method pro-the authors depends on the fact that free lime combines ıstantly with water while the basic calcium silicates are much more slowly by water. It is carried out as fol- weighed quantity of the substance, 0.2 to 0.5 gram, is ed in a platinum crucible to drive off moisture or in the :ments is ignited over the blast-lamp to expel any carbon ınd, after cooling in a desiccator, is again weighed. A ›s of distilled water, which has been recently boiled, are ed and the crucible is placed in a cylindrical brass box with a screw-top carrying a brass inlet and outlet tube. ·ead of the cap is made air-tight with a little white lead The box is placed in an air-bath and the temperature to 85° C., and allowed to remain at about this point for nutes. Then a slow current of air, which has been freed sture and carbon dioxide, is drawn through the appara- the temperature is raised to 185° C. After drying for inutes, the apparatus is disconnected, the crucible is t and placed in a desiccator containing caustic potash and ld it is weighed. The increase in weight is the water by the lime to form calcium hydroxide. Calcium hy- vas heated to 250° C., and found to be constant in weight.

ıethod can be used for rapidly determining the value of :s for the purpose of making quicklime and for determin- alcium oxide in commercial quicklime.

:atement that lime may become "dead burnt" or inert to ıen very highly heated has frequently appeared in chem- ature and is generally believed by practical men. The ›btained some semifused particles of lime by heating l Iceland spar in an electric arc and found that it would npletely in twenty-four hours at ordinary temperature at 85° C. slaking was complete in two hours.

:tic compounds of lime and silica and lime and alumina assumed to be present in Portland cement were made by molecular quantities of these substances with an oxy- blowpipe. On hydration the silicates reacted only ith water but the aluminates behaved like free lime when › 85° C. with water for thirty minutes.

tion experiments on a series of cements prepared by the ınd on a series of commercial cements led to the conclu- : if a Portland cement containing less than 10 per cent. ıa takes up more than 3 per cent. of water, the excess is ee lime in the cement. B. S. Cushman.

ctical Method for the Quantitative Determination of n Photographic Paper. By Dr. Leo. Baekeland. *phic Times-Bulletin*, 36, 60–61.—Silver can be easily ed in photographic paper by suspending the paper between platinum electrodes in a 5 per cent. solution of potassiu cyanide and electrolyzing with an electromotive force of not mor than 4 volts.

If an unknown product is under examination, a preliminar qualitative analysis should be run to make sure that no interfe ing metals are present. B. S. CUSHMAN.

Notes on the Separation of Gold, Silver and Platinum. B H. CARMICHAEL. *J. Soc. Chem. Ind.*, **22**, 1324–1325.—Th separation of platinum and silver from gold was attempted b boiling alloys containing equal amounts of gold and platinum bu with varying amounts of silver in strong nitric acid, but onl negative results were obtained. The proportion of platinum t gold was then gradually decreased and in an alloy containing 0. gram of gold, 0.005 gram of platinum and 0.5 gram of silver, complete separation of the platinum and silver from the gold wa obtained.

Attempts to separate silver from gold and platinum by parting with sulphuric acid gave no satisfactory results. Accurate assays could probably be obtained by running proof alloys under similar conditions and deducting the surcharge of silver found from the regular assay. Alloys of silver and platinum were also parted both in nitric and sulphuric acids but no accurate separations were obtained.

The determination of platinum in an alloy of gold, silver, and platinum by precipitation as potassium chloro-platinate is difficult even after the silver has been removed by treating first with sulphuric and then with nitric acid, for on concentrating the solution of gold and platinum with potassium chloride some metallic gold is usually precipitated. B. S. CUSHMAN.

A Study of the Quantitative Determination of Antimony. BY LEWIS A. YOUTZ. *School of Mines Quarterly*, **24**, 407–421.—The author draws the following conclusions from his work:

1. Antimony is completely oxidized by nitric acid and potassium chlorate in hydrochloric acid solution, in the absence of tartaric acid.

2. Antimony is completely reduced by boiling with sulphur dioxide in open or closed vessels; or by sulphur dioxide and potassium bromide; or by potassium iodide in cold hydrochloric acid solution.

3. The direct titration of antimonic solutions by the Herroun-Weller method gives very concordant results, but is 1 per cent. low, calculated on metallic antimony with the atomic weight 120.4.

4. The conditions for obtaining this result must be within rather narrow limits and are as follows:

(*a*) 0.200 to 0.250 gram of antimony (calculated as metal).

(*b*) Oxidized and dissolved by hydrochloric acid, 1 cc. nitric acid, and successive portions of potassium chlorate, in the absence of tartaric acid, solution reduced to 50 cc., and 15 or 20 cc. of concentrated hydrochloric acid added, then made up to about 700 cc. by the addition of water.

(*c*) Three or 4 grams of potassium iodide crystals added to the cold solution.

(*d*) Liberated iodine immediately titrated by sodium thiosulphate checked against copper, potassium bichromate, or iodine.

5. The error of 1 per cent. is not due to mass action, but is yet unexplained. B. S. CUSHMAN.

A Method for the Direct Determination of Alumina. BY CHAS. E. RUEGER. *Eng. Min. J.*, 77, 357-359.—The author first discusses the methods in general use for determining alumina and then gives the following method :

Saturate the filtrate from the silica with hydrogen sulphide, filter and wash the precipitated sulphides. Boil the filtrate to expel hydrogen sulphide, oxidize the iron with nitric acid or potassium chlorate and precipitate the iron and alumina with ammonium hydroxide and ammonium chloride. Wash the hydroxides thoroughly with hot water and dissolve them in a little hot dilute hydrochloric acid. Dilute the solution with cold water until it is only luke-warm, neutralize the free acid with carbonate of soda, add 10 grams of sodium sulphite and stir until the sulphite dissolves. If a permanent precipitate has not appeared, add more sulphite. Dissolve the precipitate in the least possible amount of hydrochloric acid, cover the beaker with a watch-glass and heat rapidly to boiling. If the red color of the ferric iron does not rapidly disappear as the temperature rises, add a few drops of hydrochloric acid. Boil until the odor of sulphur dioxide disappears from the solution, set aside until the precipitate settles and filter. A filter-pump can be used to advantage. The filtrate will turn brown from the oxidation of the iron. Wash the precipitate three times with hot water, dissolve it in a little hot dilute hydrochloric acid, nearly neutralize with sodium carbonate and precipitate as before. The second precipitate will be practically free from iron and the alumina obtained from it should be white with possibly a faint bluish tinge.

Titanium and phosphorus are precipitated with the aluminum but zinc, manganese, copper and nickel are without influence on the results. B. S. CUSHMAN.

Improvements in the Cyanide Assay for Copper. BY THORN SMITH. *Eng. Min. J.*, 76, 581.—Dissolve the sample in nitric and hydrochloric acids, evaporate to small bulk, add 10 cc. of sulphuric acid and heat until fumes of sulphur trioxide are freely evolved. Cool, add 75 cc. of water and two strips of aluminum foil and boil until the copper is precipitated. If much iron is present, fifteen to twenty minutes boiling will be required. Test for complete precipitation of the copper by adding 10 or 15 cc. of strong hydrogen sulphide water.

Filter through a disk of filter-paper in a Gooch crucible, adding a *few* drops of hydrofluoric acid to the solution in the crucible and in the beaker, if the filtration is slow. Wash the precipitated copper with hydrogen sulphide water, dissolve it in 5 cc. of nitric acid, using bromine water to rinse the crucible and aluminum foil. Cover the beaker, boil until the bromine has been expelled, add 10 cc. of ammonium hydroxide, cool, dilute with water and titrate to a faint pink color with potassium cyanide solution. For standardizing the cyanide solution, an ore or matte in which the copper has been determined electrolytically should always be used.

B. S. CUSHMAN.

The Use of Ferrous Sulphate in the Estimation of Chlorates and Bromates. BY I. K. PHELPS. *Am. J. Sci.*, 167, 201–202. —The use of ferrous sulphate for determining the oxygen in hypochlorites and chlorates when mixed with chlorides was suggested by Carnot (*Compt. Rend.*, 122, 449). To test the accuracy of this process the author used the following method.

A weighed portion of a dry potassium chlorate, 15 cc. of sulphuric acid (1 : 4) and an excess of standardized ferrous sulphate solution were heated to boiling in a trapped flask, cooled to room temperature by immersion in running water, diluted to 400 cc., and after the addition of 1 to 2 grams of manganous chloride, titrated to color with standard potassium permanganate solution.

Potassium bromate was determined in a similar manner except that the excess of ferrous salt used in the reduction was found by titration with decinormal iodine in alkaline solution.

The results given show that the processes are sufficiently accurate for analytical work.

B. S. CUSHMAN.

The Precipitation of Magnesium Oxalate with Calcium Oxalate. BY NICHOLAS KNIGHT. *Chem. News*, 84, [illegible].—This article gives the results of [illegible] analyses of dolomitic mixtures containing varying amounts of calcium and magnesium carbonates. The conclusion drawn from the work is "that the magnesium precipitated with the calcium varies from an almost inappreciable amount to a considerable quantity."

B. S. CUSHMAN.

**Apparatus for the Electrolytic Determinations of Metals,
a Rotating Cathode.** By E. S. Shepherd. *J. Phys.*
7, 568–570 (1903).—An electrolytic apparatus arranged
ools and commercial laboratories is described, in which
s device of a rotating cathode is adopted.

G. N. Lewis.

ORGANIC CHEMISTRY.

the Preparation of Formiminoethyl Ether. By H. B.
AND O. F. Black. *Am. Chem. J.*, 31, 207–209.—The
s modify Pinner's method of the preparation of this sub-
by replacing the anhydrous hydrocyanic acid by mercuric
e and have found that in this way a yield of 84 per cent. of
uble salt $HCl.HNCHOC_2H_5.HgCl_2$ can be easily obtained.
outline of the process is as follows: Proper proportions of
ed mercuric cyanide and mercuric chloride are mixed with
ous alcohol and ether, the mixture cooled and treated
ry hydrochloric acid gas until the mercuric cyanide goes
lution. On standing, the double salt crystallizes out as
ss plates. The double salt reacts with an ethereal solution
ine, giving the same diphenylformaniline obtained by
by the action of aniline on formiminoethyl ether. It also
with alcohol, giving orthoformicethyl ether. This latter
n shows that the salt can be used in place of the chloride
niminoethyl ether in preparing acetals according to the
method, since that depends on the formation of nascent
rmic ether.

V. J. Chambers.

Action of Bromine on 2,6-Dibromparaphenylenediamine.
Loring Jackson and D. T. Calhane. *Am. Chem. J.*,
–220.—The object of this research was to make a more care-
dy of the conversion of paraphenylenediamines into quin-
he above diamine being used, as it was hoped that the inter-
e products might be more stable if the benzene ring were
with bromine atoms. A dry ethereal solution of bromine
n a similar solution of the diamine, giving a dark vivid
recipitate which seems to be one of the products interme-
etween the diamine and the quinone. The study of this
tate indicated the presence of a hydrobromic acid salt of a
, $C_6H_2Br_2(NH)_2HBr$, the amount of bromine used being in
with the following:

$$r_2(NH_2)_2 + Br_2 = C_6H_2Br_2(NH)_2.HBr + C_6H_2Br_2(NH_2)_2HBr.$$

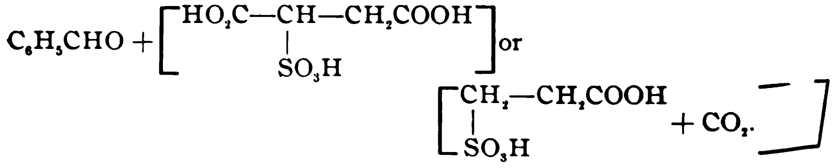
een precipitate reacted with an aqueous solution of so-
arbonate, which set free a base dissolving in ether with a
ed color, with the formation of the calculated amount of

sodium bromide. Ammonia and amines gave similar results. Such an ethereal solution gave a green precipitate with hydrobromic or hydrochloric acid gas exactly like the original. The free base was too unstable to analyze or to make derivatives of. That this colored base is a step in the conversion of diamines into quinones seems evident from the facts that the 2,6-dibromparaphenylenediamine is converted into 2,6-dibromquinone by treating it with water and bromine, and that the colored salt gives the same product with the same reagents. Paraphenylenediamine, when treated with bromine in ethereal solution, gave a similar precipitate of a bright blue color. Analytical figures agreed fairly well with $C_6H_4(NH)_2HBr$. The blue precipitate undoubtedly contained some $C_6H_2Br_2(NH)_2HBr$ as well as a little $C_6H_4(NH_2)_2.HBr$. It was more stable than the above green precipitate into which it passed by further action of bromine. Orthophenylenediamine gave a colored precipitate similar to that from the paradiamine but less stable, while the metadiamine gave only a white precipitate, probably a substitution product. Monobenzoyl-2,6-dibromparaphenylenediamine was prepared. Short, creamy white prisms with a vitreous luster, m. p. 194°. V. J. **Chambers.**

The Addition of Acid Sulphites to Cinnamylidenemalonic Acid. By Elmer P. Kohler. *Am. Chem. J.*, **31**, 243–256.—Cinnamylidenemalonic acid contains the combination of single and double linkages which Thiele has called a "conjugated system of vicinal double unions $>C = CH.CH = C<$. When such a substance adds a molecule of another substance, addition is supposed to take place on the α- and Δ-carbon atoms. The author adds a molecule of acid sulphite to the above acid and proves in the following manner that the addition takes place on the α- and β-carbon atoms, the sulphoxyl group going to the β-position :

$$C_6H_5CH : CH.CH.(SO_3K)CH(COOH)_2 \rightarrow$$
$$C_6H_5CH : CHCH(SO_3K)CH_2COOH.$$

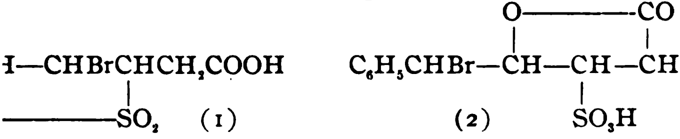
This acid oxidizes to benzaldehyde, carbon dioxide and β-sulphopropionic acid.



$$C_6H_5CHO + \left[\begin{array}{c} HO_2C—\underset{\underset{SO_3H}{|}}{CH}—CH_2COOH \end{array}\right] \text{or} \left[\begin{array}{c} \underset{\underset{SO_3H}{|}}{CH_2}—CH_2COOH \end{array} + CO_2. \right]$$

An aqueous solution of equimolecular quantities of acid potassium sulphite and the unsaturated acid react slowly in the cold, but rapidly on heating with formation of the potassium salts of benzal-sulphoethylmalonic acid and benzalsulphobutyric acid. The

oducts are formed by action of sulphur dioxide on a solu-
neutral potassium sulphite and the unsaturated acid. The
g salts are separated by means of their different solubili-
a strong solution of potassium hydroxide. The *potassium*
enzalsulphoethylmalonic acid crystallizes in white shining
It is easily decomposed, acids, alkalies, or prolonged
with water reconverting it into the unsaturated acid and the
lphite. The *acid potassium salt of benzalsulphobutyric*
best made by adding potassium sulphite, in small quanti-
the finely powdered unsaturated acid suspended in boil-
er, carbon dioxide being evolved on each addition. The
t after purification is a salt crystallizing in plates, easily
in boiling water, less so in cold, insoluble in alcohol, a
substance, water, acids or alkalies causing little or no re-
even on prolonged boiling. The *neutral potassium, cal-*
d barium salts and the *free acid* were prepared, the latter
less needles (m. p. 76°) not hydroscopic, readily soluble
er, alcohol, and acetone. It decomposes at 100° or above,
sulphur dioxide and cinnamenylacetic acid. The oxida-
benzalsulphobutyric acid is best brought about by slowly
a solution of barium permanganate to a boiling solution of
tassium salt and phosphoric acid. The products of the
n are carbon dioxide, benzaldehyde (and a little benzoic
and the potassium salt of β-sulphopropionic acid. The
n of bromine to a moderately cold aqueous solution of ben-
hobutyric acid or its salts produces a very unstable red
tate which soon loses color, dissolves, and from the solu-
white crystalline substance separates. From the analytical
obtained on this white substance and from the fact that it
izes twice as much alkali when boiling as when cold, the
lowing formulas were thought possible



$$\text{I—CHBr}\underset{\displaystyle \text{SO}_2}{\underset{|}{\text{CH}}}\text{CH}_2\text{COOH} \quad (1) \qquad \text{C}_6\text{H}_5\text{CHBr—}\overset{\text{O}}{\overset{|}{\text{CH}}}\text{—}\underset{\displaystyle \text{SO}_3\text{H}}{\underset{|}{\text{CH}}}\text{—}\overset{\text{CO}}{\overset{|}{\text{CH}_2}} \quad (2)$$

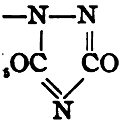
ould easily give stable esters while (2) should form esters
rough the acid chloride and these should be unstable.
bstance in question formed easily the stable *methyl ester*,
s prisms, m. p. 148°, and ethyl ester, m. p. 121°. This
es (1) for the compound though it does not prove where
phone ring is closed nor the position of the bromine atom.

V. J. CHAMBERS.

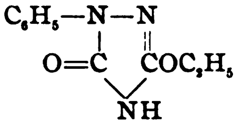
tion Products with Dimethylaniline. BY C. LORING
N AND LATHAM CLARK. Preliminary notice. *Ber. d.*
Ges., 37, 176–180.—Having observed the formation of a
ully crystalline but very unstable addition product from an

alcoholic solution of dimethylaniline and tetrabromorthoquinone, the authors examine the behavior of more than fifty compounds with dimethylaniline. A few obtained from substituted nitrobenzenes and from substituted quinones are described in this article. The main facts brought out are that the addition compounds contain 1 molecule of dimethylaniline and 1 molecule of the combining body, that they are all unstable bodies losing dimethylaniline easily, that substituted quinones form addition compounds analogous to those obtained by Hepp from trinitrobenzene, that they all have a pronounced color, that the replacement of all the hydrogen atoms in trinitrobenzene does not hinder the formation of addition products. The examination of the behavior of other nitrogen compounds has already been begun, and it has been found that pyridine will give addition compounds also. EXPERIMENTAL.—The substituted benzene or quinone was dissolved in dimethylaniline to saturation. After standing a few minutes, cold alcohol was added until the addition product separated. This was filtered off quickly, dried between filter-papers and analyzed. With 1,3,5-trichlortrinitrobenzene, $C_6Cl_3(NO_2)_3.C_6H_5N(CH_3)_2$, brown-red prisms from alcohol, m. p. 78°; with 1,3,5-tribromtrinitrobenzene, dark brown prisms, decomposing below 50°; with 3-brom-2,4,6-trinitrotoluene, dark red prisms, m. p. 120°; with 1,3,4,5-tetrachlordinitrobenzene, orange-yellow prisms, m. p. 113°; with 4-brom-3,5-dinitrobenzoic acid ethylester, orange-red prisms, m. p. 56°; with 1,3,5-triiododinitrobenzene, brass-yellow prisms melting at about 160°; with 1,3,5-trianilinodinitrobenzene, dark brown-red prisms, m. p. 120°; with chloranil, dark blue prisms with a bronze luster; with trichlorquinone, dark blue prisms with bronze luster, m. p. 65°. V. J. CHAMBERS.

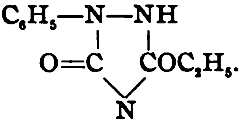
A Note on Some of the Reactions in the Urazole Series. BY S. F. ACREE. *Am. Chem. J.*, **31**, 185–188.—A reply to a recent article by Wheeler and Johnson (*Am. Chem. J.*, **30**, 24) in which they state that by the action of ethyl iodide on monosilver phenylurazole they were able to obtain 1-phenyl-3,5-diethoxyurazole (I) and phenylurazole but no 1-phenyl-3-ethoxyurazole (II). The author states that the last is really the normal product of the reaction but, as it is easily soluble in alkali, Wheeler and Johnson lost it when they washed the ethereal solution of the reaction product with alkali. Wheeler and Johnson took exception to Acree's supposition that the substance 1-phenyl-2-hydro-3-ethoxyurazole (III) might exist as a definite compound tautomeric with 1-phenyl-3-ethoxy-4-hydrourazole (II). These writers believe that these two formulas probably represent the same compound. Acree gives references in support of the possibility of this kind of tautomerism and states what he believes would be the chemical behavior of the compound if formed.



(I)



(II)

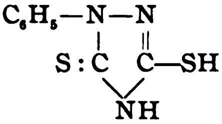


(III)

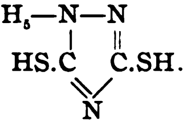
eler and Johnson treated monosilver phenylurazole with 'l chloride and obtained a new diacetyl derivative of phenyl-)le but no monacetyl derivative. The author claims that aonacetyl derivative is the chief reaction product.

V. J. CHAMBERS.

1-Phenyl-3,5-Dithiourazole. BY S. F. ACREE AND O. W. ox. *Ber. d. chem. Ges.*, 37 184–185.—Phenylurazole and nyl-3-thiourazole had previously been shown to have the enol structure analogous to formula (I) and to act as mono- acids. 1-Phenyl-3,5-dithiourazole was made with the ex- tion that it would have the di-enol structure (II) and act as ong dibasic acid, but it formed a monosilver salt and when ed in the presence of phenolphthalein took up only one atom ali. Acree had shown, however, that this behavior on titra- oes not definitely exclude the possibility of a di-enol structure.



(I)



(II)

RIMENTAL. — *α-Thioncarbethoxy-phenyl-3-thiosemicarbazide*, N($CS.OC_2H_5$)NH.CS.NH_2, was made by action of phenyl- micarbazide on thioethyl chlorcarbonate in boiling acetone ion, m. p. 173°. On heating this ester with a slight excess lium hydroxide in aqueous solution and subsequent acidifica- 1-phenyl-3,5-dithiourazole was obtained as a white precipi- that became yellow on standing. When crystallized from ol it melted at 181°.

V. J. CHAMBERS.

e Reduction of Triphenylcarbinol and Its Homologues to Corresponding Triphenylmethanes. BY S. F. ACREE. *d. chem. Ges.*, 37, 616–617.—Triphenylmethane was obtained most quantitative yields by reducing triphenylcarbinol or tri- ylbrommethane with zinc and hydrochloric acid. Small ınts must be worked with at one time. EXPERIMENTAL.— calculated amount of hydrochloric acid was added very slowly boiling alcoholic solution of triphenylcarbinol and an excess inc dust. After heating the proper time the alcoholic solu- was filtered off and diluted with water. Triphenylmethane rated in almost pure condition. The method for treating triphenylbrommethane was practically the same. Diphenyl-α-naphthylmethane was prepared from its carbinol by the same process. Yield almost theoretical. V. J. Chambers.

The Preparation of Phenylurazole from α-Carbethoxyphenylsemicarbazide. By S. F. Acree. *Ber. d. chem. Ges.*, 37, 618–625.—A study of the course of the reaction by which phenylurazole is obtained by action of alkali on α-carbethoxyphenylsemicarbazide followed by addition of acid. The reaction may take place in one of two ways. (1) The alkali aids the condensation of the ester, with loss of alcohol and water, and formation of the alkali salt of phenylurazole. This gives the free urazole on acidification. (2) The alkali causes a saponification of the ester with formation of the alkali salt of α-carboxyphenylsemicarbazide. This on addition of acid passes to the free phenyl-semicarbazide-α-carbonic acid which then loses water passing to the urazole. The problem was worked out by the isolation and study of the compounds obtained by the action of alkali on α-carbethoxyphenylsemicarbazide and its homologues and a comparison of them with those obtained from phenylurazole. The two classes were found to be quite distinct, so method (2) is the correct one. Experimental.—A water solution of equal molecules of α-carbethoxyphenylsemicarbazide and potassium hydroxide and a drop of phenolphthalein was heated until the red color disappeared. On evaporation, a white residue of the *potassium salt of phenylsemicarbazide-α-carbonic acid*, $C_6H_5N(COOK)NH.CO.NH_2$, was obtained. With hydrochloric acid it gave pure phenylurazole; the addition of silver nitrate to its solution gave the silver salt of the carbonic acid; heated above 150° it lost 1 molecule of water, passing to phenylurazole potassium. *Phenylurazole potassium* was prepared in a similar manner from equal molecules of phenylurazole and potassium hydroxide. It contained no water of crystallization; hydrochloric acid gave only phenylurazole; silver nitrate precipitated phenylurazole silver. The *silver salt of phenylsemicarbazide-α-carbonic acid*, prepared as above, gave α-carbethoxyphenylsemicarbazide with ethyl iodide; when heated to 150° it lost 1 molecule of water, giving phenylurazole silver. *Phenylurazole silver*, from phenylurazole potassium, contained no water of crystallization and gave 1-phenyl-3-ethoxy-5-triazolone with ethyl iodide. The *potassium salt of phenylthiosemicarbazide-α-carbonic acid*, prepared from equal molecules of potassium hydroxide and α-carbethoxyphenylthiosemicarbazide, contained 2 molecules of water of crystallization. Its behavior was similar to that of the potassium salt of phenylsemicarbazide-α-carbonic acid. *1-Phenyl-3-thiourazole* acted like phenylurazole potassium. The *sodium salt of 1-phenyl-4-methylthiosemicarbazide-α-carbonic acid* was prepared as the other carbonic acids and had properties similar to them. The *silver salt of 1-phenyl-4-methyltriazolyl-3-mercaptan*

was prepared and contained no water of crystallization. The action of sodium methylate on α-carbethoxyphenylsemicarbazide was tried to see if this reaction would give phenylurazole. It did so.
V. J. CHAMBERS.

On α-Naphthyl Magnesium Bromide. BY S. F. ACREE. *Ber. d. chem. Ges.*, 37, 625–628.—α-Bromnaphthalene was found to unite readily with magnesium, giving a practically quantitative yield of α-naphthylmagnesium bromide. This reacted readily with carbon dioxide, ketones, benzoyl chloride, formic acid ester, benzaldehyde, benzil, and other like substances. Michler's ketone gave a carbinol that had a deep green color in acid solution. Carbinols containing the α-naphthyl group, even when added in small amount, were found to give intensely colored solutions with concentrated acids. That this color is not due to the oxidation of the carbinol follows from the fact that the addition of water destroys the color and reprecipitates the carbinol in quantitative yield and unchanged in appearance or melting-point. The author suggests that this color can best be explained by assuming, with Kehrmann, a quinoid structure for the salt produced. EXPERIMENTAL.—*α-Naphthylmagnesium bromide.* α-Bromnaphthalene, dissolved in a small amount of absolute ether, was heated with magnesium ribbon and a trace of iodine or methyl iodide. The metal went into solution and gave the above body in crystalline condition on cooling. It decomposed without melting when heated to 280°. *Diphenyl-α-naphthylcarbinol* was obtained by the interaction of α-naphthylmagnesium bromide and benzophenone in ethereal solution, m. p. 134°–135°. It gave an intensely green-blue color when dissolved in concentrated sulphuric or glacial acetic and hydrochloric acids. The addition of water gave the carbinol again in pure condition. Color reaction was very delicate. *α-Naphthoic acid* was obtained by action of carbon dioxide on an ethereal solution of the naphthyl bromide. *Phenyl-α-naphthylketone* was the product of the action of benzoyl chloride on the naphthyl bromide. The author expected to get phenyldi-α-naphthyl carbinol but the naphthyl bromide did not act again with the phenyl-α-naphthyl ketone first formed. The author reports that α-naphthylmagnesium bromide reacts readily with benzaldehyde to form phenyl-α-naphthyl carbinol (m. p. 86°) and also without difficulty with acetophenone, acetone, acetaldehyde and benzoïn.
V. J. CHAMBERS.

BIOLOGICAL CHEMISTRY.

A Study of the Nitrogenous Constituents of Meat. BY H. S. GRINDLEY. *Science*, 19, 444.—The object of the experiments was to increase the present very limited knowledge of the proteids of flesh, in the condition in which they exist in meat as used for food. The conclusions drawn are as follows: Cooked meat is much less soluble in the solvents employed than raw meat. The acidity of a solution of flesh increases upon the coagulation of its proteids. Cold water extracted 3.06 per cent. nitrogenous matter from raw meats and only 0.27 per cent. from boiled meat. A 10 per cent. solution of sodium chloride extracted from raw meats 6.10 per cent. proteid matter and only 0.5 per cent. from boiled meat. A 0.15 per cent. solution of hydrochloric acid dissolved from raw meat 2.28 per cent. proteid and from boiled meat 2.30 per cent. A 0.15 per cent. solution of potassium hydroxide dissolved from raw meat 2.88 per cent. of proteid and 4.84 per cent. proteid from the boiled meat. Hot water removed from raw meats 0.49 per cent. and from boiled meats 6.24 per cent. proteid matter. Of the total proteid existing in the original raw meats 95.22 per cent. was dissolved by extracting successively with the above named reagents, while only 50.59 per cent. of the total proteid of the boiled meat was thus made soluble. F. P. UNDERHILL.

The Soluble Ferments of Cow's Milk. BY JOSEPH LESPERANCE. *Med. Records*, **65**, 447–450.—Cow's milk contains numerous ferments. The presence of trypsin, pepsin, the lipasic and oxidizing ferments and a glycolytic ferment has been definitely determined. There is, moreover, reason to expect further discoveries in this direction and this is not improbable when the extremely complex nature of milk is taken into consideration

F. P. UNDERHILL.

A History of Saliva, Its Physiology, Chemistry and Pathology. BY HAROLD M. HAYS. *Med. News*, **84**, 582–587.—A review of the literature of saliva considered from the several standpoints. F. P. UNDERHILL.

The Physiology and Pathology of Biliary Secretion. BY HUBERT RICHARDSON. *N. Y. Med. J.*, **79**, 688–691.—The physiological action of bile salts is as follows: Injected in small doses into the blood stream they produce disintegration of the erythrocytes with a liberation of haemoglobin; brought into contact with the cells of the body they cause their disintegration. Blood in which there is a certain amount of bile agglutinates the typhoid bacillus, and to a certain extent *Bacillus coli communis*. Administered by the mouth they have a cholagogue action, and are, in fact, the only drugs that have the power to produce an increased flow of bile, both solid and liquid constituents being increased. The presence of bile salts in the blood acts as a stimulus to the liver cells. In small doses they aid coagulation. In large doses they arrest coagulation. In small doses they act as vaso dilators while in large doses they produce vaso constriction. They reduce motor and sensory irritability, and slow the heart beat by direct action on the heart muscle and the cardiac ganglia. They act on the higher cerebral centres, causing coma and death.

F. P. UNDERHILL.

The Corroborative Method of Urinary Analysis. BY A. L. BENEDICT. *Med. Times*, 32, 101–103. This article gives a review of the tests which should be made for abnormal constituents in the urine. F. P. UNDERHILL.

Specific Erythrolysis. BY CLARENCE QUINAN. *Beiträge zur Chem. Physiol. u. Path.*, 5, 95–110.—The results obtained in these experiments may be summarized as follows: Substances capable of diffusion play no rôle in specific erythrolysis but merely maintain the osmotic pressure. Soluble globulin possesses no specific activity. The same is true of the insoluble globulin and very probably of the serum albumin. From the theoretical as well as from the practical standpoint, one is justified in accepting the view that specific erythrolysis as a result of the action of specific colloidal bodies corresponds to the mode of action excited by enzymes. F. P. UNDERHILL.

The Coagulation of the Blood of Some Arthropods. BY LEO LOEB. *Beiträge zur Chem. Physiol. u. Path.*, 5, 191–208.—With vertebrates as well as with invertebrates, besides the coagulation of fibrinogen, an agglutination of the form elements of the blood may take place. In either of the classes of animals agglutination of blood cells or blood platelets may be obtained independently of coagulation of fibrinogen. In invertebrates the mass of agglutinated cells may be easily transformed into fibrin-like threads. The agglutinated cell masses of the invertebrates have a strongly coagulating action upon the fibrinogen present in plasma. The agglutinated cell masses of goose blood have a relatively weaker influence upon the coagulation of the blood plasma of the goose. The action of tissue-coagulines (muscle, liver, lymph-glands of vertebrates, muscles of invertebrates) of both vertebrates and invertebrates is specific. This specificity does not hold true for either class of animal with respect to the coagulation accelerating factors present in blood-coaguline. If the plasma of callinectus be greatly diluted, the tissue-coagulines are made inactive, while the blood coagula still effect a coagulation, although upon concentration of the plasma the tissue-coagulines may be made as strongly or even more strongly active than the ferments contained in the blood-coaguline. The same is true with goose plasma. The first coagulation of the invertebrates may be compared with the agglutination thrombasis of the vertebrates. The coagulation of fibrinogen in invertebrates could not be proved. Leech extract inhibits the coagulation of vertebrate blood. It had no noteworthy inhibitory influence upon the blood of invertebrates. In food. The conclusions drawn are as follows: Cooked meat is much less soluble in the solvents employed than raw meat. The acidity of a solution of flesh increases upon the coagulation of its proteids. Cold water extracted 3.06 per cent. nitrogenous matter from raw meats and only 0.27 per cent. from boiled meat. A 10 per cent. solution of sodium chloride extracted from raw meats 6.10 per cent. proteid matter and only 0.5 per cent. from boiled meat. A 0.15 per cent. solution of hydrochloric acid dissolved from raw meat 2.28 per cent. proteid and from boiled meat 2.30 per cent. A 0.15 per cent. solution of potassium hydroxide dissolved from raw meat 2.88 per cent. of proteid and 4.84 per cent. proteid from the boiled meat. Hot water removed from raw meats 0.49 per cent. and from boiled meats 6.24 per cent. proteid matter. Of the total proteid existing in the original raw meats 95.22 per cent. was dissolved by extracting successively with the above named reagents, while only 50.59 per cent. of the total proteid of the boiled meat was thus made soluble. F. P. UNDERHILL.

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The Paths of Excretion for Inorganic Compounds. I. The Excretion of Strontium. BY LAFAYETTE B. MENDEL AND HENRY CLARKE THACHER. *Am. J. Physiol.*, 11, 5-17.—Strontium salts are eliminated to a relatively small extent only by the kidneys even after direct introduction into the circulation. The excretion in the urine begins soon, and ceases usually within twenty-four hours. The larger portion of the strontium eliminated is found in the faeces, whether the introduction of the element be per os, subcutaneously, intravenously, or intraperitoneally. The place of excretion is apparently restricted to the region of the alimentary tract beyond the stomach. A functional relation to certain phenomena of intestinal peristalsis, etc., is suggested. The rate of elimination is slow, and is apparently influenced by the calcium-content of the food. Strontium is found deposited in the body chiefly in the bones; traces may be met with in the liver and muscles. F. P. UNDERHILL.

On the Cleavage of Gelatine. BY P. A. LEVENE. *Ztschr. physiol. Chem.*, 41, 8-15; See this Review 26, R 168; also *Am. J. Physiol.*, 10, xxxix. F. P. UNDERHILL.

On an Enzyme of the Thymus Gland. BY WALTER JONES. *Ztschr. physiol. Chem.*, 41, 101-109: See this Review 26, R 173; also *Am. J. Physiol.*, 10, xxiv-xxv. F. P. UNDERHILL.

A Salt Solution in Locomotor Ataxia. BY SAMUEL A. MATHEWS AND ORVILLE H. BROWN. *Am. J. Physiol.*, 11, 1-5.—The injection of a mixture of 250 cc. *m*/8 sodium chloride, 125 cc. *m*/8 sodium sulphate, 120 cc. sodium citrate, and 5 cc. *m*/8 calcium chloride, into the subcutaneous tissues of a man suffering from locomotor ataxia, causes pains and other sensations similar to those experienced in the earlier stages of the disease. This occurs even though it has been years since such pains were first felt. The pains decrease successively after each injection, until about the fourth or fifth, after which they may not occur at all.
F. P. UNDERHILL.

Rhythms of Susceptibility and of Carbon Dioxide Production in Cleavage. BY E. P. LYON. *Am. J. Physiol.*, 11, 52-59.—The fertilized egg of arbacia, if exposed to temperatures of 32°

° C., for a few minutes and then allowed to develop at room mperature, shows a marked difference, depending on the time ter fertilization that the heating takes place. It is especially nsitive to heat just before cleavage. It is most resistant ten to enty minutes after fertilization. Just before the first cleavage is again resistant to heat, but becomes susceptible again just fore second cleavage. There is, therefore, a rhythm of susptibility and resistance. The effect of exposing arbacia eggs low temperatures (2°–0° C.) for several hours and then allowg development, varies greatly, being also dependent on the length time after fertilization that the lowering of temperature takes ace. The susceptible period for cold is quite different from that heat, being, in fact, more nearly or perhaps exactly the same the resistant period for heat (ten to fifteen minutes after ferization). This is also the stage susceptible to lack of oxygen. e resistant period for cold seems to come some minutes before e first cleavage and thus does not coincide with the stage most sceptible to heat. The production of carbon dioxide in the gmenting arbacia egg probably runs in rhythms, the greatest ount being produced at the time of active cytoplasmic division.

F. P. UNDERHILL.

Nicotine Tolerance in Rabbits, and the Difference in the Fatal se in Adult and Young Guinea-pigs. BY ROBERT A. ATCHER. *Am. J. Physiol.*, 11, 17–28.—Nicotine is very uncerin in its action. While death is due to failure of respiration, tificial respiration, if effective at all, must be begun before the nters show evidence of marked depression. The stimulating ects of heat are undoubtedly useful in combatting the toxic ects. No cumulative effects can be seen when nicotine is given ily for several days. Nutritional disturbances follow its pronged use, as is indicated by the constant loss of weight after a ne, and by the appearance of ulcers at a point some distance m the seat of injection, disappearing with the cessation of its e, and reappearing upon resumption. The preparation of an titoxic serum for nicotine is not practical, if possible, with esent knowledge. The average fatal dose of nicotine for an ult rabbit is approximately 20 milligrams per kilogram; for an ult guinea-pig the average fatal dose is approximately 40 milliams per kilogram, the very young guinea-pig being much more sceptible, the average fatal dose for one of 150 grams or less ing about 15 milligrams per kilogram. F. P. UNDERHILL.

On the Coagulation of Milk. BY A. S. LOEVENHART. *Ztschr. ysiol. Chem.*, 41, 177–206.—The conclusions of this work may summarized as follows: With respect to the action of their lts upon casein and paracasein the metals fall into three groups. he salts of the first group precipitate neither casein nor paracasein; those of the second group precipitate paracasein quickly from its solution at room temperature, casein being precipitated only after long standing at 40° C., or by raising the temperature; those of the third group coagulate both bodies promptly at room temperature. To the first group belong the strongest metals, sodium, potassium, ammonium, and doubtless rubidium and cesium. The second group contains lithium, beryllium, magnesium, calcium, strontium, barium, manganese, iron (ferrous), cobalt and nickel salts. To the third group belong all the other heavy metals including ferric iron. With the progress from the stronger to the weaker metals there is an increase in the precipitating power of their salts upon casein and exactly the same thing is true for paracasein. The precipitation of paracasein by all means of precipitation of colloid substances, as by acids, salts and alcohol, takes place with greater ease than that of casein. From this it is concluded that paracasein in its solutions exists in greater solution aggregates than does casein. There is no proof that paracasein and casein are different bodies, since all differences found are of a physical nature, and might easily be explained by the hypothesis that they are modifications of one and the same substance. It is shown that decalcified milk is precipitated by salts of the following metals: Calcium, strontium, barium, manganese, iron (ferrous), cobalt, and nickel. These facts are in favor of the theory according to which the coagulation of milk depends in great part upon a change in the arrangement of its mineral constituents, without, however, fully explaining the process of coagulation. The coagulation of stale milk by heating is indirectly caused by the acid produced in such milk; the direct cause of the coagulation is to be sought in the calcium salts. The phenomenon can be exactly imitated if to the milk is added not more acetic acid than would suffice to precipitate the casein. Addition of ammonium oxalate hinders the coagulation in both cases. These experiments signify that the calcium salts present in the milk are not there in a form suitable for the precipitation of casein or paracasein. From this it follows that during rennet action calcium salts must be made of use for precipitation. The metacasein reaction of Roberts was taken into consideration and its direct dependence upon the presence of calcium salts proved. Three general methods lead to the metacasein reaction: (1) The employment of small quantities of rennet; (2) partial separation of calcium salts by boiling the milk or by addition of calcium precipitating substances; (3) dilution of the milk and hence dilution of its calcium salts. It is shown that during the rennet action the calcium salts are very gradually made of service for precipitation. Further it was proved that metacasein represents a stage which is present in every rennet coagulation of milk and that the time that lapses between the appearance of the metacasein reaction and that of the coagulation stands in inverse ratio to the antity of rennet employed. The investigation of rennet action on undiluted and diluted milk showed that the transformation casein into paracasein took place somewhat before the separa-n of the calcium salts and that this transformation occurred th the appearance of the metacasein reaction. The time that ses between the appearance of the metacasein reaction and that the coagulation is employed in making the calcium salts of vice. According to the degree in which the calcium salts ac-mulate, the temperature necessary for the metacasein reaction lowered, until suddenly at 40° C. coagulation takes place.

F. P. UNDERHILL.

On the Mechanism of the Action of Saline Purgatives, and e Counteraction of their Effect by Calcium. BY JOHN BRUCE ACCALLUM. *Univ. Cal. Pub. Physiol.*, **1**, 5–6 : See this Review, , R 109.

On the Relative Toxicity of Distilled Water, Sugar Solutions nd Solutions of the Various Constituents of the Sea Water or Marine Animals. BY JACQUES LOEB. *Univ. Cal. Pub. hysiol.*, **1**, 55–71 : See this Review, **26**, R 67.

The Limitations of Biological Research. BY JACQUES LOEB. *niv. Cal. Pub. Physiol.*, 1, 33–37.—Lecture delivered at the dication of the Rudolph Spreckels Physiological Laboratory of e University of California, August 20, 1903.

F. P. UNDERHILL.

The Relations of Biology and the Neighboring Sciences. BY ILHELM OSTWALD. *Univ. Cal. Pub. Physiol.*, 1, 11–31.—ecture delivered at the dedication of the Rudolph Spreckels hysiological Laboratory of the University of California.

F. P. UNDERHILL.

The Influence of Saline Purgatives on Loops of Intestine Removed from the Body. BY JOHN BRUCE MACCALLUM. *Univ. al. Pub. Physiol.*, 1, 115–123.—When a loop of the small intesine of a rabbit is removed from the body, emptied, and suspended n *m*/8 sodium chloride solution containing $^1/_{70}$–$^1/_{50}$ of its volume f *m*/8 barium chloride in such a way that the ligatured ends are bove the surface of the fluids, it is found to contain after fifteen twenty minutes a measurable quantity of fluid resembling the ormal intestinal juice. Peristaltic movements characteristic of e action of barium also appear in the loop. A loop similarly mmersed in *m*/8 sodium chloride, sulphate or citrate shows active ristaltic movements, but contains no fluid after fifteen to twenty inutes. If it is suspended however in a *m*/2 solution of one of ese salts, a measurable quantity of fluid collects in the loop. A loop emptied and suspended in $m/8$ sodium fluoride is found to contain a measurable quantity of fluid after fifteen to twenty minutes. It is possible in this way to produce peristaltic movements of the intestine by solutions whose concentration is not great enough to cause increased secretory activity. It is further seen that both peristaltic movements and secretion of fluid into the intestine may be brought about in a loop entirely separated from the central nervous system and which is not supplied with blood. The secretion does not take place after the first fifteen to twenty minutes. Loops placed in $m/8$ calcium chloride show no peristaltic movements and no secretory activity. Calcium chloride added to any of the solutions described above counteracts, to a certain extent, their action not only on the muscle, but also on the glandular tissue. F. P. UNDERHILL.

The Secretion of Sugar into the Intestine Caused by Intravenous Saline Infusions. BY JOHN BRUCE MACCALLUM. *Univ. Cal. Pub. Physiol.*, 1, 125–137.—The intravenous injection of large quantities of $m/8$–$m/6$ sodium chloride causes a greatly increased secretion of fluid into the intestine, which is the more marked, the more rapid the injection. This increased secretion of fluid into the intestine is analogous to the production by the same means of polyuria. The action of the salt solution on the intestine is the same as that of the saline purgatives, and is analogous to diuresis. The intravenous injection of large quantities of $m/6$ sodium chloride solution causes marked excretion of sugar by the intestine. The concentration of this substance in the intestinal juice may be as high as 0.25 per cent. The excretion of sugar by the intestine is analogous to the excretion of sugar by the kidneys (glycosuria) produced by the same means. Under similar circumstances sugar is also excreted by the stomach. Urea is found in the intestinal juice normally in small quantities, and also after saline infusions. All of these facts support the idea that the intestine is in part an organ of excretion supplementary to the kidneys. The secretory activities of the two organs are stimulated in many cases by the same salts (sodium chloride, sodium sulphate, barium chloride, sodium citrate, etc.) and are suppressed by calcium. Sugar and urea are excreted by the intestine under the same circumstances which accompany their secretion by the kidneys. F. P. UNDERHILL.

On the Production and Suppression of Glycosuria in Rabbits through Electrolytes. BY MARTIN H. FISCHER. *Univ. Cal. Pub. Physiol.*, 1, 77–79 and 87–113.—The injection of 75–100 cc. of a $^1/_6$ molecular sodium chloride, sodium bromide, sodium iodide, or sodium nitrate solution during each fifteen minutes into the circulation of rabbits brings about a polyuria and a glycosuria. The polyuria evidences itself in ten to fifteen minutes after the beginning of the injection, and lasts as long as the injection is continued (twenty-seven hours). The glycosuria does not appear until about two hours after the beginning of the injection and lasts from six to eight hours. The amount of sugar excreted in the urine is at first small, rapidly increases to a maximum and then gradually falls to zero. The amount of sugar excreted when the excretion is at its height lies above 0.25 per cent. When the excretion of sugar has fallen to zero, continued infusion of the sodium salts causes no more sugar to appear in the urine, even though the polyuria continues as before. If a less concentrated solution of sodium chloride than *m*/6 is injected intravenously, polyuria is still brought about, but glycosuria appears not at all or only much later than when the same quantity of *m*/6 sodium chloride solution is injected. If a more concentrated solution of sodium chloride is injected, glycosuria appears the more rapidly the greater the concentration of the sodium chloride solution. If glycosuria is started in an animal by the intravenous injections of pure solutions of sodium chloride, sodium bromide, sodium iodide or sodium nitrate, the excretion of sugar can be markedly lessened or suppressed entirely by substituting for the *m*/6 solutions of sodium chloride, bromide, iodide or nitrate a mixture of one of these with calcium chloride. Animals which will excrete no more sugar in their urine when a certain amount of *m*/6 sodium chloride solution alone is injected can usually be caused to excrete sugar by substituting for the pure sodium chloride solution a mixture of *m*/6 sodium chloride with sodium citrate. When sodium citrate is given to animals which are already excreting a small amount of sugar, the excretion of sugar is increased. Animals seem to vary in regard to the ease with which glycosuria can be produced in them. A considerable latent period exists before the specific effects of the various salts show themselves. For long intervals of time the amount of urine excreted is about equal to the quantity of *m*/6 sodium chloride solution injected. Sodium chloride solutions of a higher concentration than this cause more urine to be excreted than salt solution is injected. When equimolecular sodium bromide, iodide or nitrate solutions are injected, less urine is usually excreted than salt solution is injected. This is true also of sodium chloride solutions of a lower concentration than *m*/6. In long-continued experiments, no matter what the nature of the injection fluid, the kidneys apparently become impaired after a time, and less urine is excreted than salt solution is injected. The substitution of a mixture of sodium chloride, bromide, iodide or nitrate with calcium chloride for a pure solution of these sodium salts is followed by a temporary fall in the amount of urine excreted in the unit of time. The substitution of a mixture of sodium chloride, bromide, iodide or nitrate with sodium citrate is usually followed by a temporary rise in the amount of urine excreted in the unit of time. Sometimes sodium citrate brings about a fall in the amount of urine excreted. The latter is probably due to a constriction of the ureters. The amount of urine and sugars excreted bear no relation to each other and vary independently of each other. Albuminuria is a frequent, though not constant, accompaniment of the glycosuria.

F. P. UNDERHILL.

The Influence of Calcium and Barium on the Flow of Urine. BY JOHN BRUCE MACCALLUM. *Univ. Cal. Pub. Physiol.*, 1, 8[illegible]82.—In dogs and rabbits the quantity of urine may be markedly diminished or almost entirely inhibited by the introduction of calcium chloride into the circulation. Calcium chloride also diminishes the flow of urine produced by diuretics. In all cases *m*/8 solutions were used. The addition of a small quantity ($^1/_8$ cc. *m*/8 solution) of barium chloride to the blood causes a marked increase in the flow of urine. The action of barium is counteracted by the injection of calcium chloride. If larger quantities of barium chloride be added to the blood, the flow of urine ceases abruptly and complete anuria ensues. Calcium chloride added to the blood may at times overcome this action but the influence of the barium generally persists. The action of calcium and barium on the flow of urine are in every way analogous to their influence on the intestine.

F. P. UNDERHILL.

A Contribution to the Chemistry of the Creatinine and Creatine in the Urine. BY OTTO FOLIN. *Ztschr. physiol. Chem.*, **41**, 223–242.—In this article is given a method for the quantitative determination of the creatinine of the urine. The method, which is colorimetric, depends upon the reaction of Jaffé—an alkaline picric acid solution of creatinine giving a bright red color. The method is applicable to all normal urines but not to urine containing acetone, acetic acid, acetic ether or hydrogen sulphide. By means of this reaction it is found that 10 grams of creatinine dissolved in 10 cc. of water give a maximal red coloration five to ten minutes after the addition of 15 cc. of 1.2 per cent. picric acid solution and 4–8 cc. of a 10 per cent. sodium hydroxide solution. This fluid diluted to 500 cc. gives a solution of which 8.1 mm. in depth has the same color as that of 8 mm. N/2 potassium bichromate solution. The colorimeter of Duboscq is here recommended. The readings on the colorimeter should be within [illegible]-3 mm. Applied to the urine the method is as follows: Ten cc. urine are placed in a 500 cc. graduated flask, 15 cc. picric acid solution and 5 cc. sodium hydroxide added. The fluid is well shaken and allowed to stand for five minutes. The liquid is then made up to 500 cc. with water, well shaken, the depth of color determined in the colorimeter, with the potassium dichromate solution as the standard. From this reading and the above facts the quantity of creatinine may be calculated. It was also determined that normal urine often contains a minimal quantity of creatine, and a method for its determination is also given. Further a method is given by which creatinine may be obtained from the urine in a pure condition. It is also shown that the ordinary Kjeldahl determination for nitrogen in such compounds as creatinine and creatine is accurate, contrary to the results of Kutscher and Steudel.

F. P. UNDERHILL.

PHARMACEUTICAL CHEMISTRY.

A Chemical Study of the Seed of Rhus Glabra. BY G. B. FRANKFORTER AND A. W. MARTIN. *Am. J. Pharm.*, **76**, 151.—But about 20 of the 120 known species of Rhus are considered as having any medicinal or commercial value. Various parts of these plants are used in the dyeing and tanning industries. Very little work had been done upon the seed until the authors subjected it to analysis. They found it to contain 6.86 per cent. of moisture, a high per cent. of ash, due to a large amount of dust collected by the pubescence of the husk, several acids in the husk, while extracts of a complex nature were obtained with ether, alcohol and water. The husk amounted to 40 per cent. of the weight of the entire seed.

The seed proper leaves 1.98 per cent. of ash and is but slightly acid. It contains about 9 per cent. of a single oil obtainable by exhaustion with ether, which solidifies at 24° C., has a specific gravity at 20° C. of 0.92, is optically inactive and almost non-drying. Its saponification number in milligrams of potassium hydroxide per gram of oil is between 190 and 200 and its iodine value about 86. The unsaponifiable matter probably contains cholesterols.

The husk contains acid calcium malate, tannic acid and a black non-drying oil consisting really of two distinct oils, the mixture being solid at 20° C., and having a specific gravity slightly lower than that of the oil from the seed proper. W. H. BLOME.

The Genus Eucalyptus. BY HENRY KRAEMER. *Am. J. Pharm.*, **76**, 177.—A review of several monographs that have appeared during the past year, including Baker and Smith's scheme of grouping the eucalyptus based upon the character of the oil they yield. W. H. BLOME.

Soaps of the Vegetable Kingdom. BY DR. N. KRUSKAL. *The Pharm. Era*, 31, 303 and 329.—Nature furnishes us with a large number of ready-formed vegetable soaps which are used for washing silk, wool and other fabrics. These substances all exhibit the same physical properties; they lather with water, have a peculiar acrid taste, dissolve red blood corpuscles, and hold finely

divided substances in suspension. The most common examp of this principle are saponine from *Quillaja saponaria* and fr *Polygala senega*. The saponaceous principle was formerly nan according to the plant in which it occurred, but as it has b demonstrated that this principle is always the same where found, the old nomenclature has been dropped. A carefully p pared alphabetical list of 229 plants belonging to 43 families, of which contain saponine, is given.
W. H. BLOME

Damiana (The Mexican Tea), Turnera Aphrodisiaca. J. U. LLOYD. *Pharm. Rev.*, **22**, 126.—Prof. Lloyd writes fr La Paz, Mexico, the home of damiana, describing the plant, growth, surroundings, uses, adulteration and exportation. Mexico it is used alike by young and old, men and women, a slightly stimulating tonic.
W. H. BLOME

An American Pine Tar Oil. BY EDWARD KREMERS. *Pha Rev.*, **22**, 150.—While turpentine oils are generally obtained water or steam distillation from the oleoresin, the pine tar oils obtained by the destructive distillation of the roots abounding resin. While working on these oils the author found that w the pine tar oils are shaken with a 5 per cent. solution of cau soda, the aqueous layer, after separation of the mixture, v colored yellow or even brown. Oil of turpentine rectified w calcium or sodium hydroxide under like treatment gave no c reaction.
W. H. BLOME

The Volatile Oil from Monarda Citriodora. BY I. W. BR DEL. *Pharm. Rev.*, **22**, 153.—The present preliminary work shown the drug to yield about 1 per cent. of a reddish oil. T presence of carvacrol and its oxidation product hydrothymoqu one have been established. Cymene and citral are indicated, their presence has not yet been fully demonstrated.
W. H. BLOME

SANITARY CHEMISTRY

A Critical Study of the Methods in Current Use for Determination of Free and Albuminoid Ammonia in Sewa BY EARLE B. PHELPS. *Journal of Infectious Diseases*, **1**, 327–3 —The author first briefly states the most common method u for determining free and albuminoid ammonia in sewage sewage effluents, the determination of free ammonia being distillation with live steam after the addition of sodium carbon and the determination of albuminoid ammonia by adding alkal potassium permanganate to the liquid from which the free a monia has been distilled off and continuing the distillation w live steam. He then shows by experiments with urea, gelat caseïn, egg albumen, peptone and naphthylamine, substances likely to occur in sewage, that these substances when heated to 100° in water made alkaline with sodium carbonate give off nitrogen or free ammonia, egg albumen giving off 3.2 per cent. of its total nitrogen in this way. The determination of free ammonia by distillation he therefore considers as inaccurate and advocates, it being replaced by the direct reading of free ammonia, as proposed by Farnsteiner (Leitfaden für die chemische Untersuchung von Abwasser, Hamburg, 1902). As a result of a series of experiments the following method is given as best suited to all round work at a sewage experimental station. Mix 50 cc. of sewage with an equal volume of water in a short Nessler tube; add a few drops of a 10 per cent. copper sulphate solution, and after complete mixing add 1 cc. of a saturated solution of potassium hydroxide. When the heavy precipitate which is formed falls to the bottom of the tube, leaving the supernatant liquid clear, which takes place in a few minutes, take an appropriate amount of the clear solution, usually from 2 to 5 cc., dilute to 100 cc. with ammonia-free water, and nesslerize. If the sewage contains appreciable quantities of hydrogen sulphide, add to the liquid when the copper sulphate solution is added a few drops of a 10 per cent. solution of lead acetate. In his study of the determination of albuminoid ammonia the author determined the amount of nitrogen obtained by the albuminoid ammonia process given above, and the amount of nitrogen obtained by the Kjeldahl process in various nitrogenous substances with the following result. By the albuminoid ammonia process egg albumen gave 32 per cent., vitilline 18, caseïn 21, peptone 30, asparagine 73, urea 4, grass extracts—cold water 54, hot water 32, chloroform (chlorophyl) 29, tap water 45 per cent. of the amount of nitrogen found by the Kjeldahl process. These wide variations show, according to the author, the little value of the determination of albuminoid ammonia in sewage in obtaining an idea of the amount of nitrogenous matter present in the sewage, and he believes that for this determination the Kjeldahl process should be substituted, and states that he finds by a comparative study that the simple method used by Palmer (Report of Streams Examination, Chicago, 1902, p. 60) of merely digesting the sample with sulphuric acid until the liquid becomes clear and then neutralizing and distilling gives as good results as either Kjeldahl's or Gunning's method. LEONARD P. KINNICUTT.

A Simple Test for the Routine Detection of the Colon Bacillus in Drinking Water. BY W. R. STOKES. *Journal of Infectious Diseases*, 1, 341–347.—The author has made a careful study of the action of the *Bacillus colon* as to its gas-producing properties and its action on the dye known as neutral red, and as a result of this study, the details of which are given, proposes to use in the fermentation tube lactose bouillon to which 0.1 gram of neu tral red per liter has been added. With this bouillon he conside the production of 30–50 per cent. of gas, the proportion 1 pa carbon dioxide to 2 parts hydrogen, and the change of the por red wine color of the bouillon to canary-yellow or dark orange a characteristic reaction for the *Bacillus coli* and proposes it f the present as a provisional test to be controlled by isolation pure culture, with the hope that future work will prove that th isolation in pure culture is unnecessary.

LEONARD P. KINNICUTT.

Methods of Water Analysis. By A. ROBIN, Bacteriologist City Water Department, Wilmington, Del. *Am. J. Pharm.*, 7 101–116.—An account of the methods used in water analys both chemical and bacterial, and the objections to passing jud ment on the character of a water, simply from chemical dat The various chemical determinations noted are the ones that a usually employed. For the determination of turbidity, free a albuminoid ammonia, nitrites and nitrates, the standards used the Mt. Prospect Laboratory, Brooklyn, and described by M Jackson, *Tech. Quart.*, 13, are recommended. In the dete mination of turbidity, however, the Nessler tube is replaced by 100 cc. glass-stoppered bottle, it being stated that more accura results are thus obtained. After discussing the details of quan tative bacterial examination with special reference to time plating, dilution, composition of various culture mediums, con tions of cultivation, length of time of cultivation before counti colonies, the following procedure is stated as giving results fr which satisfactory conclusions can be drawn. The water is fi examined by chemical methods, then 1 cc. or a fraction of 1 is plated in gelatin, in Nährstoff-Heyden agar, in litmus lacto agar, in carbolic acid lactose agar, and in neutral red lacto bouillon. The gelatin and the Nährstoff-Heyden plates are ke at 20° C., the others at 37° C. The litmus lactose agar plat are counted at the end of twenty-four hours. The gelatin a the carbolic acid lactose agar plates at the end of two days, t Nährstoff-Heyden plates at the end of nine days. As regar the examination for the colon bacillus it is stated, "The me presence of the colon bacillus, which is so widely spread in natur is no certain indication of fecal pollution, unless the number *B. coli* is large. Unfortunately, the methods for the enumerati of this micro-organism are either too complicated for routine wo or inaccurate; and, besides, bacteriologists are not quite agreed as what constitutes a genuine *B. coli communis*, there being a numb of species not found in feces which closely resemble it."

LEONARD P. KINNICUTT.

Some Refined Methods in Water Purification. WILLIAM TOPLIS. *Am. J. Pharm.*, 76, 116–121.—A statement of the i formation that can be derived from the bacterial analysis of water, an account of the methods used in detecting the colon bacillus and a description of the roughing or preliminary filter used at the Roxborough filter plant, where a portion of the water supply of Philadelphia is purified. The filter is divided into 10 chambers, each under separate control. The filling material consists of several sizes of broken slag, the coarsest at the bottom. On top of the slag is about a layer of sponge clippings, 1 foot n thickness, pressed to about 6 inches and held down by a lattice of woodwork. The water enters at the bottom of the filter, passes up through the broken slag in fine streams, and passes through the sponge, which is the strainer. The filter delivers water at the rate of 40,000,000 gallons per acre per day, of such a quality that it can be applied to the sand filter at the rate of 5,000,000 gallons per acre per day, which is twice the rate at which sand filters are ordinarily worked. The sponge clippings cost 5 cents per pound. LEONARD P. KINNICUTT.

The Technical Analysis of Water. BY W. E. RIDENOUR. *Am. J. Pharm.*, 76, 121–125.—An account of the methods of analysis and the methods of reporting the results of the technical analyses of water by the Geo. W. Lord Company. The total solids, the silica, the oxides of iron, aluminum, calcium and magnesium, also sulphuric acid are determined by the ordinary gravimetric methods. The chlorine is determined volumetrically, using potassium chromate as the indicator. Combined carbonic acid, by titration with sulphuric acid, using methyl orange as indicator: Free carbonic acid, by adding to the water a little barium and ammonium chloride, and a known amount of calcium hydroxde solution whose value has been determined, and after standng for twelve hours and filtering, titrating with decinormal hydrochloric acid. For the purpose of reporting results, the bases and acids are united. The magnesium as far as possible is stated as magnesium carbonate in preference to reporting it as sulphate, he calcium also as far as possible as carbonate, any remaining calcium as sulphate, any excess of sulphuric acid as sodium sulphate. LEONARD P. KINNICUTT.

Sodium Sulphite: A Dangerous Food Preservative. BY CHARLES HARRINGTON. *Journal Infectious Diseases*, 1, 355–356. —Sodium sulphite is used as an admixture to meat and canned vegetables, not on account of its antiseptic properties, which are very feeble, but on account of its effect on the appearance of the ood. It confers on mince meat a brilliant red color which conveys to the purchaser an idea of freshness, a bleaching effect on canned corn and asparagus, and to Hamburgh steak a redness much more pleasing than the grayish brown color which develops n a few hours if sodium sulphite is not added. Meat which is really well advanced in decomposition can be thus disposed of as perfectly fresh, for although the number of bacteria may run as high as 500,000,000 per gram, it may give off no marked odor. The question whether or not sodium sulphite acts injuriously on the human system has been a subject of dispute, Kionka, also Scherly, stating as a result of their experiments on dogs and rabbits that it caused decided injurious effects, while Abel, Lebbin and Kallmun concluded that sodium sulphite should be regarded as harmless. Dr. Harrington, as a result of his experiments on cats, feeding them for five months on mince meat containing 0.2 per cent. of pure crystallized sodium sulphite, concludes that at least for animals and probably for human subjects sodium sulphite is a dangerous admixture to food. LEONARD P. KINNICUTT.

The Relation between Unfiltered Water and Typhoid Fever at Lorain, Ohio. BY ARTHUR BROWN. *Eng. News*, **51**, 285.—The paper gives an instructive diagram showing the death-rate from typhoid fever per 100,000 of the living population at Albany, N. Y., Hamburg, Germany, Lawrence, Mass., and Lorain, Ohio, before and since those cities used filtered water, also at Pittsburg, Pa., and at Youngstown, Ohio, which still use unfiltered water. It also contains a table showing that when the filter plant at Lorain shut down for repairs from July practically till November, 1903, the death-rate from typhoid fever which was zero for the first seven months of that year rose to 180 in August, and continued at that point till December. LEONARD P. KINNICUTT.

Other Sources of Typhoid Infection than Through the Medium of Drinking-Waters and How to Guard Against Them. BY SEARLE HARRIS. *Sanitarian*, **53**, 311–312.—The other sources noted are milk supply, ice, oysters, unwashed vegetables, contact, flies, dust. As regards possible infection from dust, Dr. Harris says numerous observers have demonstrated that the typhoid germ can retain its vitality in dry dust for a variable length of time, and recently there have been several cases in which the typhoid germs were inhaled into the lungs thus producing a true typhoid pneumonia, without any involvement whatever of the intestinal canal, and quotes Eugene Warden of the Marine Hospital Service as saying, that dust is the great disseminator of typhoid fever, and that "it would be better to filter the street sprinkling water supply and allow the drinking of hydrant water."
LEONARD P. KINNICUTT.

Septic Tank and Broad Irrigation for Sewage Disposal at the Provincial Jail, Victoria, B. C. *Eng. News*, **51**, 198.—A description with plan, cross and longitudinal section, of a small septic tank designed to treat 1200–1800 gallons sewage per day. The effluent is run upon a stiff clay soil, which, it is stated, has been much improved by the septic tank effluent, and is now used for raising of vegetables. LEONARD P. KINNICUTT.

Water Purification at Pittsburg, Pa. *Eng. Record*, **49**, 266. Col. A. M. Miller, Rudolph Hering, and John W. Hill have made eport on the purification of the water supply of Pittsburg, Pa. e report calls for forty covered sand filters of an acre each, ed on a consumption of 200 and 250 gallons per capita depend- r on the part of the city considered, the estimated cost of the nt being $6,750,000. The question of preliminary filtration ough roughing filters similar to those used at Philadelphia, ereby the first cost of the works might be reduced by about 50,000 and the maintenance charges by about $12,000 was nsidered, but in the opinion of Col. Miller and Mr. Hering it uld be taking too serious a chance to introduce them at Pitts- rg before more complete information concerning them was ob- ned, as they have not as yet been tried with water at all diffi- t to purify. LEONARD P. KINNICUTT.

A Rapid Filter Plant for the New Chester Water Co. *Eng. cord*, **49**, 245.—A description, with plans, of the new mechan- l filtration plant for Chester, Pennsylvania, a city of about 000 inhabitants taking its water supply from the Delaware ver. The city since 1891 has introduced aluminum sulphate o the water at the force main at the pumping station. In veling through 3½ miles of force main between the pumping tion and the reservoirs the coagulant became thoroughly mixed th the water, and opportunity for settlement was obtained by ssing the water successively through three reservoirs. Owing increased consumption the above method became inadequate d in 1902 the construction of a mechanical filtration plant was dertaken. The filters are 8 in number, 15 feet inside diameter, nstructed of 2¾ inch dressed cypress lumber bound with flat- n hoops, total capacity 4,000,000 gallons per twenty-four urs. LEONARD P. KINNICUTT.

Illustrated Description of Some Filter Plants and Results. MORRIS KNOWLES, Engineering Society of Western Penn., cember, 1903.—A description with illustrations of the Law- nce, Mass., of the Philadelphia, Pa., of the Little Falls, N. J., ter filtration plants and tables showing some of the results ob- ned at Lawrence, Philadelphia and the Pittsburg experimental nt. A description is also given of the new covered filter to be ilt at Lawrence and designed by Chapin and Knowles. The er is 21 bays long by 7 wide, and has a groined arch roof, de- ned to have 3 feet of earth on top ; also, it has an inverted ch floor. The net filtering area will be about three-fourths of acre. The vaulting is to have a clear span of 13 feet 2 inches, th a rise of 2 feet 9 inches and be 6 inches thick at the crown d 21 inches thick over the piers. The filter and the court are rrounded by an embankment 10 feet wide at the top and planned with sluice-way openings, so that drainage water will run to the river, but with means for closing, so that the floods of the river will not enter upon the surface. The underdrain system will consist of a concrete main collector, in the form of an arch, running the whole length of the filter in the center bay. This collector is provided with three manholes, to permit of entrance for cleaning, if the occasion demands. The laterals from this main collector consist of about 15 feet of 12-inch terra cotta channel pipe (or one-half pipe), laid with open joints, reducing to a 6-inch, and extending to the center of the outside bay. The gravel is to be 12 inches thick and of graded sizes, and this will be covered with 4½ feet of filter sand. LEONARD P. KINNICUTT.

INDUSTRIAL CHEMISTRY.

The Development of the Modern By-product Coke-Oven. BY CHRISTOPHER G. ATWATER. *Trans. A. I. M. E.*, **23**, 760. —In the United States, less than 5 per cent. of the total coal coked was done in by-product ovens in 1901. In 1903 the percentage production was brought up to about 13 per cent. In speaking of the improvements effected in this country the ovens are compared with the Otto-Hoffmann oven as perfected in Germany.

The first plant erected in this country was for the Cambria Steel Co., at Johnstown, Pa., and this type with improvements in various details was erected at Glassport, Everett, Sydney, Hamilton, Camden, and Lebanon, in this country, and Canada.

This pattern "consists essentially of a retort built of refractory materials 33 feet long, 18 to 20 inches wide and 6 feet high. The ovens are separated by a division wall containing vertical flues, through which the heat is supplied. The foundations consist of masonry arches running lengthwise of the battery, the two outer arches forming the regenerative chambers, which are characteristic of this method of firing. Through these regenerators the outgoing hot gases and the incoming air for combustion pass alternately. The regenerators are provided with reversing valves at the ends of the oven battery, in connection with the necessary chimney-stacks. The gas is admitted alternately by two burners, one at each end of the oven, to the space beneath the division wall flues. The air for combustion rises from the regenerator below to the space beneath the oven floor and passes to the combustion chamber beneath the flues. The passage of the hot gases is up the vertical flues in one-half of the division wall, along the horizontal flue at the top and down the flues at the other half of the division wall to the regenerator below. The characteristics of this construction are: 1. Vertical flues; 2. The use of regeneration."

Everett a large electrically driven larry fills the retorts. It ıas an electric door-hoist and pusher, for discharging the The principal innovation in this plant, however, is in the ›n of the gases in which the high candle-power illuminating separated from the lower candle power gas which comes later used for power purposes. The gases are treated separately. : Sydney plant the gases are not separated but an improve- has been installed, that of compressing the coal into a solid for charging. This improves the coke and increases the ty of the oven.

: plant at Hamilton, Ohio, is about the same except that the are divided.

:e recently improvements have been introduced in this type n which consist in having a series of large Bunsen burners erent points below the oven instead of at one end. This is sed with regenerators. The regenerative chambers are also ted from the oven supports to extend their length.

S. P. SADTLER.

tection of Steel from Corrosion. BY CHARLES L. NORTON. t IX of the Insurance Engineering Experiment Station, ı, Mass.—Specimens of steel of all degrees of initial cor- were embedded in concrete.

: conclusions were that rusting of the steel did not take or progress to any appreciable extent and that concrete is le for the stability and durability of modern steel structures, mixing is done properly and voids are not too numerous. ders were found to be satisfactory for mixing, if of the : degree of fineness and properly wetted.

S. P. SADTLER.

uirements for Concrete. Paper read before the Indiana eering Society at Indianapolis, January 14, 1904. BY S. B. ıERRY. He states that quartz gravel is better for cement crushed stone, as it is harder and leaves less voids in the form than in the angular condition.

: proportion of voids in concrete work to the cement is of :r importance than has heretofore been thought. The :th of concrete is proportional to the ratio of the percentage ıent to voids. The superficial area of the stone is also im- ıt, as all surfaces must be coated with cement to get ad- ı at those places. Therefore it is claimed that coarser mate- ives greater strength for this reason. Machine-mixing is mended; the sand and cement are mixed, then wetted and :he wet stone added. S. P. SADTLER.

: Making and Settling of Bleaching-powder Solutions. ARTIN L. GRIFFIN. *J. Soc. Chem. Ind.*, February 29, 1904. · the best results in the making of bleaching-powder solutions, a powder containing 38 to 39 per cent. of available chlorine should be used, as there is less trouble with the sludge.

The nature of the water has an influence on the rate of settling of bleaching-powder solutions; the presence of even small amounts of available carbon dioxide has a decided influence on the rapidity of settling. The temperature affects the settling by increasing the difference in gravity between water and sediment in warmer solutions. The steam from the siphon used by the author's company to move the solutions keeps the water up to a temperature of 55°–60° F.

The only agitation employed is "wetting out" and mixing, which only takes ten to fifteen minutes. As a strength of solution the author recommends making it up to 5° Bé. which, when mixed with the liquor from the first washing of the sludge, gives a finished solution of 3° Bé. which gives the best results in practice. This strength requires a capacity of about 1 cubic foot for each 3.75 pounds of high test powder.

A plant of small requirements should consist of two round or square concrete tanks (preferably square for facility in mixing) somewhat deeper than their width, with agitators and adjustable siphons and a common outlet pipe to a storage tank at least as large as the two tanks combined. The two mixing tanks should be flush with the charging floor and the storage tank at a lower level so that the liquors would flow into it by gravity.

One mixer contains freshly made-up solution of 4.5° Bé, and is allowed to settle while the other has a sludge from a former mix-up of the same strength. This is filled up with fresh water (or weak liquor) and agitated enough to just stir it up uniformly and is then allowed to settle. It will have a strength of about 1½° Bé. When drawn off together uniformly, the mixed liquor will have a strength of about 3° Bé. The sludge from the second liquor is again covered with fresh water, filling the mixer, making a third liquor. This is then discharged, after settling into the other tank containing strong sludge to make the second liquor in that tank.

In larger scale work, the solutions are moved by a 4-inch centrifugal pump. The solutions at 55° F. will require about five hours to settle, leaving about 3 cubic feet of sludge for each 100 pounds of powder.

The author continues as follows:

"The strong sludge is washed successively with two waters, making what is called second and third liquors. The second liquor is made by running off the settled strong sludge into the mixer by gravity, and it is to remain there without agitation until the tank has been about three-quarters filled with the third liquor, when the valve on the mixer is opened and the pump throws it on top of the settler containing the weak liquor. In this way the strength of the sludge becomes diffused through the water and washed, being denser and heavier. The result is a weak liquor uniform strength with no agitation except what it gets in pass-g through the pump and connecting piping.

"The third liquor is made by repeating the above operation on .e sludge of the second liquor, using water only. When this ıs settled and the liquor has been pumped off for the making of second liquor, the sludge is washed out into one of the two final ttling basins or tanks." S. P. SADTLER.

Artificial Silk. BY J. MERRITT MATTHEWS. *J. Soc. Chem.* *d.*, February 29, 1904.—The best known methods of manufac-ring artificial or imitation silk are reviewed.

The most used method, that of Chardonnet, in which a filament nitrocellulose is obtained by forcing a collodion solution .rough capillary openings and the filaments, after being united form a thread, are denitrated by an alkaline sulphide solution, treated at greatest length.

The grade of nitrocelluse used is of low degree of nitration, ılled pyroxylin, soluble in ether-alcohol and for this purpose .ay be made from wood pulp. A viscous solution of this collo-.on is forced through glass capillary tubes and after evaporation f the solvent (as much this as is possible being drawn f and condensed) is denitrated in a solution of ammonium sul-hide. The resulting threads are lustrous but colored yellow and .ust be treated with bleaching-powder.

The process is carried out chiefly in the town of Besancon, in rance.

Lenher's silk is another product and differs from Chardonnet's ıiefly in containing drying oil.

Artificial silk made from Cross and Bevan's "viscose" is being anufactured to the extent of about 300 pounds a day at Lans-wne, near Philadelphia, but is still in experimental stages.

During the year ending with June, 1902, there was imported to the United States about $170,000 worth of artificial silk.

Artificial silk does not have sufficient strength for anything but e filling of silk goods and is used chiefly in braids and trimmings. is especially weak when wet. It takes dyes readily.

S. P. SADTLER.

PATENTS.

NOVEMBER 3, 1903.

742,830. Oliver W. Brown, Bloomington, and Wm. F. Ces-rla, Marion, Ind. **Metallurgical process.** Zinc blende and me 2 parts each and carbon 7 parts are mixed and heated a an electric furnace to make calcium carbide, metallic zinc, and arbon disulphide.

742,845. Oscar Dresel, Elberfeld, Germany. Assignor to lberfeld Co., N. Y. **1-Acetyl amino-2-4-diaminobenzene.**

A white crystalline powder melting at 158°–159° C. soluble in water, less soluble in benzene and alcohol and changed to amino methylbenzimidazole on boiling with glacial acetic acid.

742,887. Frederick C. Meyer, Kansas City, Mo. **Mercury furnace.** A water tank with a discharge pipe, a cupola with its lower edge in the water of the tank, a pipe connecting the furnace and the tank and a fan in said pipe to draw ore fumes and products of combustion from the furnace and deliver them in the tank on the water.

742,910. Robert E. Schmidt, Elberfeld, Germany. Assignor to Elberfeld Co., New York, N. Y. **Anthraquinone-α-disulphonic acids.** Anthraquinone is treated with fuming sulphuric acid in the presence of mercury till sulphonation is completed and the resulting 1·5 and 1-8-disulpho acids are separated by fractional crystallization or by potassium chloride.

742,924. Charles W. Stevens, Harvey, Ill. **Artificial stone.** The mold is lined with a composition of sand, lime, water and sugar before packing the stone mixture therein, the cast being removed after curing.

742,997. Carl Jung and Adolf Kittel, Vienna, Austria-Hungary. Assignor one-half to Adolf Brecher, same place. **Insulating material.** A mixture of dried casein and oil 10, gum 15, and sulphur 2 parts is molded and vulcanized.

743,025. Ludwig von Orth, Berlin, Germany. **Saturating a liquid bath with gas.** The bath-tub is provided with a perforated false bottom beneath which gas is delivered by a perforated pipe, and also the tub has a transparent portion of its side through which light rays may be sent from any suitable source.

743,031. George T. Pratt, Westbrook, Me. **Insulating material.** A mixture of leather pulp 75, and sulphite wood pulp 25 parts is impregnated with mineral wax 70, rosin 20, and alum 10 parts by weight.

743,051. Joseph H. Amies, Philadelphia, Pa. Assignor to Amies Asphalt Co., same place. **Asphalt pavement.** Asphalt is powdered, mixed two to one with petroleum oil, this paste is heated to 180° F., and mixed with sand heated to 215° F.

743,071. Richard Gley and Otto Siebert, Berlin, Germany. Assignors to Aktien Gesellschaft für Anilin Fabrikation, same place. **Red mono azo dye.** The diazo compound of the sulp[illegible]no acid ($(C_6H_3)XSO_3H.NH_2$), in which X is NO_2, Cl or CH_3, is mixed with β-hydroxynaphthoic acid. A red powder slightly soluble in water, soluble violet-red in concentrated sulphuric acid, and forming red lakes, very fast.

743,120. Robert W. Watson, Silverton, Colo. **Classifier for crushed material.** A series of conical settling tanks have their lower delivery nozzles on the same level, the inflow into the

: tank, the side of each cone rising higher against the that the last cone is the largest tank in the series.

09. Herbert H. Wing, New Brighton, New York. **So-ulphite.** A copper nickel matte is smelted with sodium e and carbon, the melt run into pots, cooled, and the tops :d from the bottoms, grinding, leaching and filtering the 1 adding to the liquor copper oxide and stirring, whereby 1 is obtained as caustic soda, and on saturating the liquor lphur dioxide sodium sulphite is obtained.

14. Charles N. Anthony, Organ, New Mexico. **Assay e.** Egg shaped in plan, with two chambers, the smallest e chimney end, and both with baffle plates, and with a let.

05. Georg Merling, Frankfort-on-Main, and Robert Hochst-on-Main, Germany. Assignors to Farbwerke, eister Lucius und Bruning, Hochst-on-Main, Germany. **hylcyclohexenonecarboxylic** acid ester. Ethylic aceto-is condensed with isopropylidene ethylic aceto-acetate ; a colorless oil, miscible with ether, alcohol and benzene with water, having a feeble aromatic odor and boiling at 8° C.

13. Wm. H. Murphy, Rochester, N. Y. **Oxyhydrogen pe.** The central oxygen tube may be extended or re-and is surrounded by several hydrogen tubes forming a nd jet.

38. Franz Scherhag, Vienna, Austria-Hungary. **Color-ass.** A coat of collodion is first applied, then a water aniline dye, and finally a baking varnish.

49. Edgar C. Thrupp, Walton-on-Thames, England. **ying air and separating oxygen.** An arrangement of coolers and interchangers in which a part of the power supplied by the compressed air.

52. Edward N. Trump, Syracuse, N. Y. **Evaporating .** The liquor is heated, the pressure reduced and the collected while a circulation of the liquor is kept up, all in m.

80. Wm. B. Fitzpatrick, Pittsburg, Pa. Assignor f to Eugene Mayer, Spring Garden Borough, Pa. **In-ion preventive.** Caustic soda 40, extract logwood 12, ack, zinc sulphate and manganese dioxide 4 pounds each ;ht, water 52 gallons.

NOVEMBER 10, 1903.

22. David Bachrach, Baltimore, Md. Assignor one ɔ Emile Berliner, Washington, D. C. **Nitrocellulose und.** A slow burning nitrocellulose compound containing

pyroxylin 4 parts, camphor 2, hydrochloric acid or a salt thereof as calcium chloride 2, and sulphuric acid 1 part, and after mixing add 4 parts calcined plaster.

743,427. Charles L. Beck, Towanda, Pa. Assignor to Towanda Paint Remover Co., same place. **Paint remover.** Lime 5, sodium carbonate and salt 1 part each, and water as required.

743,431-2-3. Frederick S. Blackmarr and Joseph L. Willford, Minneapolis, Minn. Process and apparatus for making **ozone.** A series of tubes or cylinders arranged one within the other, and through which the air or oxygen is passed, and coils of wire arranged alternately in close contact with the inside and outside respectively of the glass tubes, the ends of said coils being connected to a source of electricity. 743,431 claims the process.

743,468. Robert Dempster, Marietta, Ohio. **Fixed gas.** Opposing jets of hot air and mixed air and petroleum, etc., are forced into opposite ends of heated retorts so as to make a fine spray, and the resulting vapor is driven through heated asbestos which filters out the heavier impurities that are oxidized by the air.

743,522. Henry Keppler, Brooklyn, N. Y. **Coating glass or fabrics.** First apply medium bronze lacquer and luminous powder (Balmains paint), then dry, next apply white rubbing varnish, dust immediately with bronze powder, give it a copper bath by electrolysis and paint. Applied on one side of incandescent lamp globes.

743,550-1. James A. Ogden, Deadwood, S. D. Assignor to S. W. Russell, same place. Apparatus and process of **extracting metals from cyanide solutions.** Two solution tanks, one for the cyanide solution, the other for a decomposing solution, are arranged above a mixing tank provided with an agitator and a settling tub. The two solutions are run first into the mixing tank and then into the settling tub.

743,566. Walter Rubel, Berlin, Germany. **Alloy.** Aluminum 41, copper 5, cadmium 4.

743,632. Charles E. Gale, Utica, N. Y. Assignor one-half to Martin G. Whitney, Watertown, N. Y. **Putty.** Whiting 4, white lead 1, beeswax 2, tallow 1, ground cork 1, and machine oil $^1/_{25}$ part.

743,664. Robert E. Schmidt, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. **Anthraquinone-α-sulphonic acid.** The potassium salt forms straw-yellow brilliant leaflets hardly soluble in water; this solution on adding hydrochloric acid and zinc dust turns an intense yellow, when heated to 180° C. with ammonia it becomes α-aminoanthraquinone, and on treatment with an aqueous solution of methylamine at 170°–180° C. forms α-methylaminoanthraquinone.

68. Robert Suchy and Heinrich Speckefer, Griesheim-on-
Germany. Assignors to Chemische Fabrik Griesheim
n, same place. **Chromium** from chrome iron ore. The
ore is heated with sulphuric acid in excess and an oxidiz-
nt, and an electric current passed through the mixture,
e insoluble ferric sulphate is filtered off from the chromo-
acid.

77. Havens B. Bayles, New York, N. Y. **Fuel.** As-
aturated with glycerin.

32. Wm. J. Knox, West Fairlee, Vermont. Assignor to
Westinghouse, Pittsburg, Pa. **Cuprous magnetic**
Molten copper is oxidized in the presence of magnetic
f iron in a vessel with basic or neutral lining.

33. As above for Chemical Compound. **Cuprous oxide**
in molten homogeneous solution magnetic oxide of iron.

78. Joseph Turner, Huddersfield, England. **Yellow**
n-Dinitrodiphenylamine-*p*-sulphonic acid is combined with
id, heated, and the dye salted out. It is a bright yellow
soluble in water.

02. Wm. J. Armbruster, St. Louis, Mo. **Pigment.**
carbonate, aluminum hydroxide and barium sulphate.
ion of barium hydroxide and an alkaline carbonate is made
ed to a solution of aluminum sulphate, then barium sul-
added and the precipitate recovered.

18. Fred Pape, New York, N. Y. **Composition** to pre-
hesion of paper to rubber in printing. Powdered litho-
stone 300, gelatine 1, and glycerin 2 parts are mixed and
to the rubber first coated with gum arabic 6, and fish glue

59. Samuel Turner, Sowerby Bridge, and Frederick W.
d, Baley, England. Treating hot **refuse soapsuds.**
is blown through the suds to oxidize and cool it, soot or
ed, and finally acid to curdle and separate the grease.

86. Arthur Nicolaier and Paul Hunsalz, Berlin, Ger-
Assignors to E. Schering, same place. **Methylene hip-
acid.** A white crystalline powder difficultly soluble in
nd melting at 151° C. Made by the reaction of hippuric
paraformaldehyde in presence of sulphuric acid.

NOVEMBER 17, 1903.

31. Wm. B. Brookfield, Syracuse, N. Y. **Making steel.**
or less parts each of chromium and molybdenum
ed with 70 or more parts of iron, the mass broken
gments and again fused in crucibles.

32. As above, using tungsten in place of molybdenum.

33. As above, using tungsten, molybdenum and chro-

744,034. As above, using molybdenum alone with the iron.

744,035. As above, for the process of mixing a base and hardening metal to form an alloy, melting the mass, breaking it into fragments, and remelting it in a crucible.

744,036. As above, for melting a part of the hardening metal with the iron in the first fusion, and adding the remainder in the second fusion.

744,077. Charles H. Ingalls, Danvers, Mass. Assignor to the General Electric Co., New York, N. Y. **Commutator.** A commutator for an electric motor is coated with a soluble sulphide which may be a sulphide of the metal of which it is made, or may be potassium polysulphide.

744,095. Guy Osborn, New York, N. Y. Assignor to De Ronde Osborn Co., same place. **Paint remover.** Benzine, benzene, and carbon disulphide 5 each, amyl acetate 2.5 and acetone 37.5 gallons, paraffin of 120°, 10 pounds.

744,128. Emerson, H. Strickler, Baltimore, Md. Making **trisodium phosphate.** A solution of niter cake is applied to calcium phosphate, the mixture concentrated, furnaced in the presence of carbon, the furnaced product dissolved in water and the phosphate crystallized out.

744,132. Carrington C. Tutweiler, Philadelphia, Pa. Assignor to United Gas Improvement Co., same place. Apparatus for **gas analysis.** A burette and manometer is centrally mounted on a stand with an absorption apparatus on each side, connecting pipes, and a peculiar four-way cock having three openings in the same plane, two up and one down, and a fourth at right angles, the plug having two inclined passages and a branch passage.

744,170. Andre Darlat, Paris, France. **Coating with metal.** The object to be plated is brought in contact with metallic aluminum in an alkaline bath containing a pyrophosphate of an alkali metal and a salt of the metal to be deposited in presence of ammonium chloride.

744,171. Henry T. Davis and Ernest Berrett, Lewisham, England. Assignors to Davis-Perrett, Limited, London, England. **Separating oil** from water by electrolysis. A conducting liquid as a solution of soda or potash is added to water containing oily particles in an emulsive condition and an electric current is passed through it, whereby the particles are agglomerated and the water is then filtered.

744,208. Gottlieb Kolb, Mannheim, Germany. Composition for **hardening steel.** Colophony 70, prussiate of potash 30, copper vitriol and linseed oil 10 each.

744,218. Ludwig Mond, London, England. **Making gas.** A bed of fuel is blown to incandescence and thereby distilled, a part of the gas produced is forced upwardly through the incandescent

by making said gases permanent, which are then mixed
remaining gases and the whole forced through a hot
t such a temperature as not to decompose the ammonia
hile making all the gas permanent.

. Guy Smith, Girard, Ohio. **Tanning compound.**
lum 10, sodium carbonate 2, ferrous sulphate $^1/_{16}$, and
loride 2, with water 25 parts.

. Wilhelm Traine, Wiesbaden, Germany. **Oil var-**
tty oils are mixed with resin oils 100 each, resin 50,
ad 1, and naphthalene 25 parts.

. Arthur De Wint Foote, Grass Valley, Cal. **Viscid**
ating surfaces. Slaked lime and petroleum are mixed
l on the concentrator surface as an adhesive to catch the

. Walter T. Scheele, Baltimore, Md. Assignor to
ooper, same place. **Varnish.** The process of subject-
minuted gum to a ketone whose boiling-point is between
27° C. at a temperature not to exceed 60°–65° F. The
y be acetone.

. Paul Seidel, Ludwigshafen-on-Rhein, Germany. As-
Badische Anilin und Soda Fabrik, same place. **Light**
An indigo powder so fine that its specific gravity is 0.1
hich can be dissolved in a fermentation vat, and which
noistened with water will make a homogeneous paste
not deposit on standing three months.

. Edgar R. Sutcliffe, Leigh, England. **Artificial**
calcareous cement is ground and thoroughly mixed,
per cent. of a hot slurry of Portland cement is added,
hole molded and steamed five to ten hours.

. Leopold H. Dehoff, Ludwigshafen-on-Rhein. As-
Badische Anilin und Soda Fabrik, same place. **Hydro-**
discharge. A discharge mixture is used made of a
m hydrosulphite free from metal, and a thickening
starch, etc. See patent 662,339 for the hydrosulphite.

. Eugene Donard and Henri Labbe, Paris, France.
ids from maize. The corn is first dried, then the fat
with a fat solvent as ether, and the albuminoids dis-
t of the material with ethyl alcohol, from which they
itated with water and then dried.

. Jacob Mellinger, Baltimore, Md. **Fuel binder** for
. Calcined soda 75, water 375 parts are mixed and
l to 1.5 specific gravity, 120 parts of infusorial earth are
ed and dissolved to 1.25 specific gravity. (Water glass.)

. Romedius Panzl, Muskegon, Mich. **Acid-proof**
r sulphite boilers. Calcined chamotte, slag, burnt ce-

ment and coal tar equal parts, and enough sodium silicate in water to make a plastic mass adapted to spread on the inside of the boiler.

744,666-7-8-9 and 70. Bernhard Zwillinger, New York, N. Y. These patents are for apparatus for **carbonizing material** and are assigned to American Fuel and Distillation Co., of New Jersey. The last includes the process of deoxygenizing atmospheric air, heating the resulting gas till it will carbonize the material in a bee-hive kiln at not to exceed 800° F., removing the carbonized material and circulating the resulting gases through the kiln to carbonize more material.

744,689. Romedius Panzl, Muskegon, Mich. **Acid-proof lining** for pulp digesters. Chamotte calcined 7, cement 3, and sodium silicate and water to make of required consistency.

744,690. **As above** for equal parts by volume of calcined chamotte, slag, burnt cement, coal tar and sodium silicate.

NOVEMBER 24, 1903.

744,720. Theodore F. Colin, Elizabeth, N. J. **Desulphurizing sulphur-bearing petroleum.** A slightly acid solution of sulphates of copper and iron, and sodium chloride is applied to the petroleum and the mixture agitated with an air-blast.

744,732. Max Engelmann, Elberfeld, Germany. Assignor to the Elberfeld Co., New York, N. Y. **Dialkyl barbituric acid.** Urea and dialkyl cyanoacetic esters are condensed with alkaline alcoholates with splitting off of ammonia by treatment with saponifying agents, like hot sulphuric acid.

744,734. Jesse C. Evans, Greensboro, N. C. **Sizing.** Paraffin oil 100, paraffin wax 25, sal soda, borax, and sodium sulphate $^1/_4$ part each.

744,750. James W. Green, Portland, Oregon. **Preserving eggs.** The eggs are placed in a vessel that is exhausted, then an antiseptic gas like sulphur dioxide is admitted and afterwards exhausted, then the eggs are coated with soluble glass in the vacuum, then removed and dried.

744,759. Thomas H. Hicks, Fort Wayne, Ind. Assignor to the Hicks Gold and Silver Extraction Co., of Georgia. Apparatus for recovering **mercury.** A reciprocating pan with an amalgamated lining, and adapted to contain ore and water, amalgamated joints in said lining for the passage of superfluous mercury, grooves in said pan beneath the joints and means to agitate the ore.

744,765. Lucius R. Keogh, Pembroke, Canada. Assignor one-third to Noah Joseph Gareau, same place. **Alumina** and byproducts. A mixture of aluminum sulphate, iron sulphate, sodium chloride and carbon is steamed to give hydrochloric acid, and make a mixture of alumina, iron oxide and sodium sulphate, the temperature is then raised to a red heat in a reverberatory furnace and steam supplied, the mixture finally lixiviated and the alumina precipitated as a hydroxide.

744,795. Louis C. Reese, London, England. **Extracting grease** from liquids by solvents. The liquid is first treated by vapors of the solvent whereby the liquid is heated and the vapors condensed, the matter being dissolved by the condensed solvent, and the mixture separated by the different specific gravities, the solution of extracted matter treated with more solvent and finally separated by evaporation. Applied to removal of grease from water.

744,810. Daniel F. Sherman, Chicago, Ill. Assignor to Concentrated Fruit Co., of Cal. **Preserving fruit.** The fruit is pulped, strained and cooked, all in a vacuum.

744,908. George M. Dalls, Chicago, Ill. Assignor to Ezra S. Booth, same place. **Coal economizer.** Air-slaked lime 245, salt 25, charcoal 17, paraffin wax and brimstone 5 each, and soda-ash and zinc sulphate 2 each, parts by weight.

744,920. Frederik Jahn, Ridley Park, Pa. Assignor to Harrison Bros. Co., Philadelphia, Pa. **Hydroxides of alkalies and alkaline earths.** An aqueous solution of their sulphides is electrolyzed in presence of an extended porous anode, as barium sulphide in presence of finely divided iron.

744,997. Rosa H. Boyd, Seattle, Wash. **Plastic compound.** Wood pulp 3, flour 6, Egyptian lacquer, liquid silicate and water 1 part each.

745,050. Louis C. Gauvreau, Allegheny, Pa. **Artificial lumber.** A pulp is made of paper, lye and alum water, and this is mixed with shavings, glue, plaster and fiber to a proper consistency.

745,097. Otto Eberhard, Ludwigslust, Germany. **Fat-free casein.** Alkali is added to milk, it is centrifugated to remove fat, and the casein is precipitated by acids.

745,122. Frank J. Tone, Niagara Falls, N. Y. **Reduction of metals.** A compound of silicon is reduced in an electric furnace having a basin beneath the zone of highest temperature in which the reduced metal may be collected and fused into a dense mass or pig.

745,139. Ribeci Belfert, New York, N. Y. **Face powder.** *Spongia fluviatilis* is dried and powdered, and gives a healthy color when applied and is fast against washing.

745,147. James I. Broughton, Walkerville, Mont. **Incrustation preventive.** Ground potatoes 75, linseed meal 14, and black oil and tallow 12 parts each.

745,224. Ephraim S. Morton, Brockton, Mass. **Roughened wire nails.** The nails are first roughened mechanically, then coated with a paste of oil and a refractory powder as pumice, and heated till the oil is dissipated, and finally the nails are tumbled.

745,263. Charles G. Sunergren, Charleston, Mass. **Photographic color printing.** Impressions are made from a key plate equal in number to the colors desired in the finished picture, the proper color is then drawn in on the portions representing the several colors, one color to each, and relief plates are made from the color plates thus produced. WM. H. SEAMAN.

OF AMERICAN CHEMICAL RESEARCH.

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WILLIAM A. NOYES, Editor.

ENERAL AND PHYSICAL CHEMISTRY.

on of Ammonia on Copper Sulphate Solutions. BY KE AND JACOB FORSSELL. *Am. Chem. J.*, 31, 268– –The authors have determined the partial pressure of t 25° above aqueous solutions containing varying f it and of copper sulphate, by the method of Gaus *org. Chem.*, 25, 238), by bubbling electrolytic gas se solutions and then through hydrochloric acid con- . resistance vessel, and measuring the decrease of con- the latter. The following table contains all their s, expressed in millimeters of mercury. The "calcu- es are those obtained from the empirical equation

$$p = 13.42 (C_{NH_3} - 3.55\ C_{CuSO_4})$$

$_{uso_4}$ and C_{NH_3} represent the concentrations of the cop- e and of the total ammonia as given in the first and imns of the table. Some of these calculations were e authors, but for most of them the reviewer is re-

per liter.	Partial pressure of NH_3.		
NH_3.	Observed.	Calculated.	Difference.
0.096	1.29	1.29	±0.00
0.242	3.22	3.25	—0.02
0.406	5.41	5.45	—0.04
0.729	9.80	9.78	+0.02
0.993	13.42	13.33	+0.09
0.239	2.12	2.08	+0.04
0.406	4.41	4.33	+0.08
0.508	5.73	5.70	+0.03
0.575	6.66	6.60	+0.06
0.730	8.71	8.68	+0.03
0.963	11.80	11.81	—0.01
0.322	2.11	2.08	+0.03
0.644	6.41	6.40	+0.01
1.000	11.23	11.18	+0.05
0.564	2.01	1.97	+0.04
0.596	2.33	2.40	—0.07
0.804	4.99	5.19	—0.20
0.994	7.45	7.74	—0.20

It will be seen that, with the exception of the last two experiments with the strongest ammonia and copper sulphate solutions the empirical formula closely conforms to the observed values though some of the deviations are perhaps greater than the experimental errors. This agreement would seem to indicate that abou 3.5 molecules of ammonia are united with 1 atom of copper, an that this proportion is independent of the concentrations of th copper and free ammonia, although the ratio of the latter varie from 1 :1 .5 to 1 :38 in the different experiments. The constanc of this atomic ratio in the complex in spite of such wide variation in the proportion of its constituents proves that there is only on (very stable) complex present in the solution in important amount (The abnormally low pressures exhibited by the concentrated solutions of the last two experiments are, however, attributed by th authors to the presence of a more highly ammoniated complex. The fact that the atomic ratio is found to be 1 : 3.55 instead of th probable value 1 : 4, requires explanation, and this matter is discussed at length in the article. Attention should, however, firs be called to the fact, mentioned by the authors, that Gaus in hi experiments, which referred to similar concentrations, found th constant ratio 1 : 3.78 for two different quantities of copper sal dissolved in normal ammonia, and that this disagreement indicate a fairly large constant experimental error in one or both sets o determinations. The explanation offered in the article is tha the deviation from the ratio 1 : 4 is due to a decrease in the solvent power of the water by the copper salt, whereby the pressure of th free ammonia is correspondingly increased ; and the attempt i made to correct the observed values for this effect, and to show that the so corrected ratio becomes approximately 1 : 4. Thoug recognizing that there should be a correction in this direction, th reviewer feels obliged to point out that the computed magnitud of it is erroneous because of the assumption made that a definit quantity of salt causes a certain absolute increment in the pressur of the ammonia equal to that in normal ammonia and independen of the value of that pressure, instead of causing a certain fractional increase. The correction properly applied to the observe constant ratio 1 : 3.55 would, therefore, give rise to a variabl ratio, which moreover would always be less, and sometimes muc less, than the calculated one of about 1 : 4. Moreover, the assumptions of the authors that the complex copper salt has th same effect on the solvent power as potassium chloride, and tha the effect is, according to Jahn's formula (*Ztschr. phys. Chem.* 18, 8[illegible], in this case proportional to the two-thirds power of th molal concentration of the salt, lack justification. In a not published subsequently to the main article, the last-named autho disclaims responsibility for the theoretical explanations offered in regard to which he was not consulted. A. A. NOYES.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

On the Geology of Brome Mountain, one of the Monteregian Hills. By John A. Dresser. *Am. J. Sci.*, **17**, 347–358; maps. —Detailed study of another and the largest of the interesting hills which rise in a line from the plain east of Montreal (see this Journal, **24**, R6, and **25**, R348), shows that "the igneous rocks, of which Brome Mountain is essentially composed, belong to three types, two of which certainly are the products of separate irruptions, and the third possibly so." The earliest intrusion represents an essexite (hessose). The second is syenitic (nordmarkose) with crypto-perthite as the feldspar. The third, of small extent, is porphyritic (sodalite-bearing felso-phyro-laurdalose.) Analyses by M. F. Connor afforded :

	Hessose.	Nordmarkose.	Laurdalose.
SiO_2	44.00	61.77	55.68
Al_2O_3	27.73	18.05	20.39
Fe_2O_3	2.36	1.77	2.10
FeO	3.90	1.75	1.95
MgO	2.30	0.89	0.80
CaO	13.94	1.54	1.92
Na_2O	2.36	6.83	9.18
K_2O	0.45	5.21	5.34
P_2O_5	0.20	0.15	0.06
TiO_2	1.90	0.74	0.60
MnO	0.08	0.08	0.31
H_2O	0.80	1.10	1.50
	100.01	99.97	99.83

A very close similarity is to be noted between these rocks and those of the neighboring Mt. Shefford. By calculation is deduced the approximate composition of the magmas from which the rocks of both Brome and Shefford, separately and taken together, may have been derived. W. F. Hillebrand.

The Canyon City Meteorite from Trinity County, California. By Henry A. Ward. *Am. J. Sci.*, 17, 383–384 ; figure.—This hitherto imperfectly known siderite, of $18^{3}/_{4}$ lbs. weight, was found nearly thirty years ago near Canyon City, in Trinity County, and was brought to Massachusetts, but had been lost track of until recently. It is deeply oxidized. The structure is octahedral, with large figures. No schreibersite was observed. Troilite is quite abundant in nodules of not over 2 mm. diameter. A re-analysis, by J. M. Davison, gave : Fe, 91.25; Ni, 7.85; Co, 0.17; P, 0.10. Specific gravity, 7.68. W. F. Hillebrand.

Two Microscopic-Petrographical Methods. By Fred Eugene Wright. *Am. J. Sci.*, 17, 385–391 ; figures.—The methods, to which reference only can here be made, are "The determination of the relative index of refraction of minerals in thin section," and "On the use of the optic normal in the microscopic determination of minerals." W. F. Hillebrand.

Gypsum Deposits of the United States. BY GEORGE I. ADAMS ET AL. *U. S. Geol. Survey Bull., No.* **223**, pp. 1 [illegible]29; plates, map.—This bulletin opens with a brief chapter on the geology, technology, and statistics of gypsum by Mr. Adams, following which are descriptions by other writers of the various occurrences by States. The only analyses of importance are one of gypsum from near Cascade Springs, South Dakota, and from near Nephi, Utah, the latter showing considerable admixture of anhydrite.

W. F. HILLEBRAND.

The Geology of the San Jose District, Tamaulipas, Mexico. BY GEORGE I. FINLAY. *Ann. New York Acad. Sci.*, **14**, pp. 247-318; plates.—The igneous rocks of this district appear to fall into three divisions in the following order, from the oldest to the youngest: (1) Nephelite syenite and diorite. (2) Andesite and dacite. (3) Basalt, tinguaite, camptonite, vogesite, limburgite. Effusive and deep-seated rocks are represented, and dikes are abundant. The nephelite syenite appears in several varieties, now as a typical syenite, now approaching litchfieldite, and again the ijolites. The other rocks are also, for the most part, represented by more than one type. Of the following analyses, I and VII are by H. S. Washington, the rest, less complete, by the author. I. Nepheline syenite (viezzenose). II. Camptonite (covose). III. Andesite (laurvikose). IV. Diorite (salemose–limburgose). V. Basalt (hessose). VI. Diorite, diabasic facies (salemose). VII. Analcite-tinguaite (miaskose). VIII. Analcite-tinguaite (laugenose).

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
SiO_2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	52.83	49.42
TiO_2	[illegible]	....	....	....	....	....	0.16	....
Al_2O_3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20.70	22.99
Fe_2O_3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.84	2.70
FeO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.19	1.89
MgO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.41	0.45
CaO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.00	2.59
Na_2O	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.47	9.94	9.63
K_2O	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.87	4.21
[illegible]	[illegible]		[illegible]	[illegible]	....	....	0.03	....
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.37	0.38
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	2.55	[illegible]	5.73
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	99.99

W. F. HILLEBRAND.

The Orbicular Gabbro at Dehesa, San Diego County, California. BY [illegible] *[illegible] California, Bull.* [illegible] plate.—The main mass of the rock [illegible] appears is a hornblende [illegible] but several

[illegible]

variant facies are shown. The orbicular facies owes its structure to a peculiar concentric arrangement of light and dark constituents, and still more to a marked radial growth of the dark mineral (olivine) in the surrounding feldspar (anorthite). The core of each spheroid consists of "an allotriomorphic granular aggregate of basic plagioclase, probably anorthite, and olivine with a subordinate amount of hypersthene." The composition of the orbules, according to J. W. Howson, is: SiO_2, 40.08; Al_2O_3, 22.86; FeO, 11.96; MgO, 12.40; CaO, 11.41; Na_2O, 1.26; K_2O, 0.38; total, 100.35. Dr. Lawson thinks the explanation of the structure is to be found by applying the laws of physical chemistry, and offers some suggestions to that end.

W. F. HILLEBRAND.

The Miocene Diabase of the Santa Cruz Mountains in San Mateo County, California. BY H. L. HAEHL AND RALPH ARNOLD. *Proc. Am. Phil. Soc.*, **43**, 16–53; map, figures.—One type of this rock (I) is light-colored and granular (diabasic), the other (II) is darker and finer grained (basaltic). The large amount of soda shown by the analyses is due to analcite, which is an abundant and interesting feature of the composition of the rocks. It is regarded as always secondary and as derived from alteration of the feldspars. Analyses by E. T. Allen of the U. S. Geol. Survey: I. One mile north of Bella Vista ranch houses—Plagioclase feldspars (labradorite), augite, olivine, ilmenite, magnetite, apatite, and secondary analcite, serpentine, chlorite, iron ores, calcite, natrolite. II. Mindego Hill—Feldspars as in I, augite, enstatite, olivine, ilmenite, magnetite, and secondary analcite, calcite, chlorite, serpentine, iddingsite, iron oxides, natrolite.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MgO.	CaO.	Na_2O.	K_2O.	H_2O-.	H_2O+.
I.	50.12	18.52	2.47	4.11	2.68	8.99	5.22	1.46	1.64	3.09
II.	49.60	16.56	4.28	4.44	5.38	9.22	3.31	1.25	1.44	2.58

	TiO_2.	P_2O_5.	SO_3.	Cr_2O_3.	NiO.	MnO.	BaO.	Total.	Sp. Gr.
I.	1.33	0.18	0.08	tr.	none	tr.	0.02	99.91	2.732
II.	1.86	0.30	0.17	0.03	none	0.08	0.06	100.55	2.825

W. F. HILLEBRAND.

Geological Survey of New Foundland. Report on the Mineral Resources of the Island for the Calendar Year, 1903, pp. 17. BY JAMES P. HOWLEY. W. F. HILLEBRAND.

The Circulation of Underground Aqueous Solutions and the Deposition of Lode Ores. BY JOHN W. FINCH. *Proc. Colorado Sci. Soc.*, **7**, 193–252; figures.—Underground waters may be divided into three zones, one or two of which may be lacking under particular conditions of topography, climate, nature of the rocks, etc. "Zone I includes all depths near the surface in which water is accumulated and conducted to a saturated zone, in all localities where a saturated zone exists." This is van Hise's "belt of weathering," or, as the author terms it, "zone of gathering!" The saturated zone he divides into one of discharge (zone II), in which the flow is in general downward toward a point of discharge, and one of no flow, or of upward flow only under special and temporary conditions, as the heat influence of vulcanism, etc. (zone III), in which case its waters may doubtless be active in the formatio of primary ore bodies. Except where there are deep open fissure zone III is believed to be rarely of great depth, a belief which i supported by the numerous observed instances of dryness in the lower workings of deep mines. The reasons for the assume static condition of this zone are fully set forth. "Zone II is th upper part of van Hise's belt of saturation. In conditions o thermal adjustment, such as normally characterize the earth's crust it is believed to embrace all of the circulating part of the underground sea." It is in this zone that the processes of secondar enrichment are active, whereby certain of the metallic stores fro the upper and more exposed parts of primary deposits are redeposited upon the unoxidized ores lower down, and thus produc most of the commercially productive deposits. The ultimat source of the mineral contents of the primary ore bodies of zone II is non-essential to the intent of the author's paper, and he refrain from extended speculation thereon. He believes that the apparently opposing theories of van Hise and Kemp "are each broadl applicable to one of the two most important phases of ore deposition, *viz.*, the primary and secondary concentrations of ores i fissure veins. In a general way then the division of undergroun water bodies into two lower zones in this paper is an endeavor t combine existing theories." W. F. HILLEBRAND.

METALLURGICAL CHEMISTRY.

On the Microstructure of Metals and Alloys. BY W. CAMPBELL. *Electrochemical Industry*, February, 1904.—A finely illustrated and well-written résumé of the principles of the structur of metals and alloys, as shown by the microscope and study o cooling curves. J. W. RICHARDS.

Production of Pig Iron in 1903. BY J. M. SWANK. *Iro Age*, February 4, 1904 (from Bulletin American Iron and Stee Association).—Reports based on complete returns from ever furnace in the United States show the output to have bee 18,009,252 tons of 2240 pounds each. Of this, 17,503,568 to were made by anthracite and coke, 504,757 tons by charcoal.
J. W. RICHARDS.

Steel Castings. BY L. L. KNOX. *Iron Age*, February 1 1904 (read before Pittsburg Foundrymen's Association).—I 1902 there were produced in the United States 255,475 tons acid open-hearth steel castings and 112,404 tons of basic open-hearth steel castings. The writer considers the basic metal castings equally as good as the acid, and much cheaper to make.

J. W. Richards.

A Decade in American Blast-furnace Practice. By F. L. Grammer. *Iron Age*, February 25, 1904 (read before American Institute of Mining Engineers) *Mechanical Conveyers.*—The steel cars reduce the cost of unloading by their steep bottoms, and these, with the bin system, car overturners and traveling bridges, represent the chief changes in handling raw material. The skip-hoist has not infrequently been introduced where the double-ring bell would have been better. The Vaughn *tap-hole gun* makes the work of the men easier, and is especially satisfactory if operated by compressed air. *Casting machines*, such as the Uehling, are working satisfactorily; the electric breaker, with iron chills, is less expensive and more satisfactory. *Weimer slag-cars* are almost exclusively used. The *slag* is very economically disposed of by granulation in a water-pit and lifting out by cranes and buckets. *Dust* is caught in pockets on the gas main, which is carried overhead so that the pockets can discharge into cars. *Gas flues* are usually lined with cheap fire-brick. *Boilers* of the water-tube type have been generally adopted. *Compressed air* is being extensively used for such purposes as the operation of the furnace bell and tap-hole gun. *Steam* is often carried at 120 to 150 pounds pressure, while compound engines, condensers and feed-water heaters have been introduced. *Hot-blast stoves* of the central combustion chamber type are gaining in popularity. *Fire-brick* have improved in quality, so that many furnaces run eight years, making 1,000,000 tons of pig iron on one lining, reducing the re-lining costs to 15 cents per ton of pig iron. *Slag-cement* is being made and sold in increasing quantities. *Flue dust* is caught by Steece or Roberts washers, and briquetting machines (such as the mould press) are in general use. The use of the double bell has saved 10 to 15 per cent. of the gas. *Gas-engines* are now running to the extent of 5000 horse-power at the Lackawanna Steel Company's plant at Buffalo, with an economy of 300 per cent. over single condensing steam engines. The coke consumption per ton of pig iron remains between 1750 and 2100 pounds, but the daily output per furnace has risen from 350 to 500 tons. Furnaces 90 feet high work more economically than higher ones; 70 to 80-foot furnaces give the maximum economy in fuel.

J. W. Richards.

The Use of Fine Mesaba Ore in Coke Blast-furnaces. By W. A. Barrens, Jr. *Iron Age*, February 25, 1904 (read before American Institute of Mining Engineers).—Prior to 1901 the furnace operated by the writer run 50 per cent. of fine ore, with almost daily slips and explosions; in 1903 it was using 93.73 per cent. of fine ore, without any serious slips. This result was attained by changes in the manner of filling and dropping stock into the furnace, and modified lines of the top of the furnace. The filling is modified so as to keep the fine ore from the walls; the top is made narrower, with more rapidly widening lines downward, so as to make room for the expansion of the ore when it is reduced. Increasing the amount of slag up to 1300 or 1350 pounds per ton of pig iron keeps the lower walls cleaner and improves the working

J. W. RICHARDS.

Iron-making in the Philippines. BY H. D. MCCASKEY. *Iron Age*, March 3, 1904.—A longer, illustrated account of an article already abstracted in this Journal, **26**, R. 95. J. W. RICHARDS.

Notes on the Behavior of Zinc in the Blast-furnace. BY J J. PORTER. *Iron Age*, March 24, 1904.—Many iron ores in Virginia contain 0.1 to 0.6 per cent. of zinc. A ring consisting mainly of zinc oxide forms just above the stock line, is very hard and heavy, and of a greenish gray color. The hardness is 4.5 on the Mohr mineralogical scale, gravity 4.96, and under the microscope small, yellow hexagonal crystals of ZnO are visible. Deposits are also formed in the downcomer, flues and hot-blast stoves Analyses show the following compositions:

	Furnace deposit.	Downcomer deposit.	Flue deposit.	Flue dust.
ZnO	89.5	87.0	76.9	26.8
Zn	0.5	0.3	none	none
SiO_2	2.9	3.4	9.8	35.9
$Fe_2O_3 + Al_2O_3$	4.7	6.4	8.7	30.1
$CaCO_3$	1.5	1.9	3.7	5.6
$MgCO_3$	0.4	0.5	0.9	1.6
C	0.5	0.5	...	...

The furnace-lining also absorbs zinc, in largest amount at the hearth and none above the fusion zone. Samples of old bric contained 49 per cent. of zinc oxide, and were soft and blac from deposited carbon. In six months a furnace used 28,74 tons of ore, carrying 202.8 tons of zinc, of which the followin amounts were accounted for:

	Tons.
In flue deposits	36.5
In downcomer deposits	18.2
In furnace deposits	16.6
In flue dust	18.3
In dust-catcher dust	16.0
Absorbed in hearth-lining	7.1
Absorbed in lining elsewhere	10.0
Lost in gas wasted at top	18.6
Total accounted for	141.3
Difference unaccounted for	61.5

The last item represents dust in stoves, boilers, chimneys and carried away in chimney gases. In no case did the cinder contain over 0.05 per cent. of zinc. Deposits in the furnace sometimes weigh 25 tons, after six months' running, and are of considerable value for the zinc. J. W. RICHARDS.

The Expansion of Cast Iron under Repeated Heat Treatment. BY A. E. OUTERBRIDGE, JR. *J. Franklin Inst.*, February, 1904. —A cast-iron bar was alternately heated to 1200° F., and cooled slowly, and a repetition of this 100 times caused it to increase in length 1 inch per foot. By twenty-seven repetitions at 1400° F., the bar increased 1.4 inches in length per foot. A steel bar treated to sixty-one repetitions at 1400° F., *shortened* 0.125 inch per foot. The cast-iron bars lost 30 per cent. in strength by the treatment. Microscopic examination (by Mr. Job) showed the expanded bars to have spaces or cracks between the crystals of iron. The treatment may be useful in expanding a piece of iron which has been made or worn too small, up to required dimensions.

J. W. RICHARDS.

The Testing of Cast Iron. BY R. MOLDENKE. *Iron Age*, February 18, 1904 (read before New England Foundrymen's Association).—A discussion of the properties of cast-iron as affected by composition, and presentation of the tentative specifications developed by the American Society for Testing Materials, *viz.*: Unless otherwise specified, all gray castings are to be made by a cupola. Light castings, below 0.5 inch thick, shall contain not over 0.08 per cent. sulphur; medium castings, 0.5 to 2 inches thick, not over 0.10 per cent.; heavy castings, over 2 inches thick, not over 0.12 per cent. A 1.25-inch round bar, 15 inches long, on 12-inch supports, shall show a transverse strength of at least 2500 pounds for light castings, 2900 pounds for medium, and 3300 pounds for heavy castings, with deflection in each case not under 0.1 inch. Tensile strength, where specified, is 18,000 pounds for light castings, 21,000 for medium, and 24,000 for heavy. This test is not recommended as a necessary specification. The load shall be applied in transverse test so that the deflection is 0.1 inch in 30 seconds. Tests of finished castings to destruction are recommended whenever possible. Detailed instructions are given regarding the molding and pouring of the test bars. J. W. RICHARDS.

A Problem in the Metallurgy of Cast Iron. BY R. MOLDENKE. *Iron and Steel Metallurgist*, January, 1904.—What is the reason some cast irons have exceptional ability to withstand severe and rough service? The writer considers that the presence or absence of dissolved iron oxide in the pig and scrap used is the greatest factor. The ability of the crystals of iron to adhere to each other tenaciously is due to freedom from dissolved iron oxide, and is much lowered by its presence. Addition of ferromanganese removes this in steel, but in cast iron it does not, because the temperature is not high enough. Aluminum acts rapidly, but cannot be used in low silicon irons because it separates out graphite. For the low silicon irons, titanium is the most promising element [illegible] 0.2 per cent. being all oxidized and leaving the metal 20 per cent [illegible] stronger. J. W. RICHARDS.

Uniformity in Malleable Heats. BY R. MOLDENKE. *Iron and Steel Metallurgist*, January, 1904.—The author calls attention to the difficulty in obtaining uniform iron when tapping a reverberatory melting furnace, the iron first tapped being from the bottom of the bath and much colder than the iron on the surface, which latter runs out perhaps thirty minutes later, and often considerably oxidized. The use of the tilting furnace is suggested, to remedy this, thus pouring iron off the surface; or to provide a fixed furnace with several tapping spouts at different levels, and tap the upper ones first. J. W. RICHARDS.

By-product Oven Gas and Tar as Fuels for the Open-hearth Furnace. BY D. BAKER. *Iron and Steel Metallurgist*, January, 1904.—The coal coked contains 33 per cent. volatile combustible matter, and yields 5,000 cubic feet of surplus gas per net ton of coal. The plant consisted of ten Campbell tilting furnaces of 50 tons capacity each, basic-lined. The gas could not be preheated, on account of carbon deposition in the checkers, and it was found that they could not run on the coke-oven gas alone. There being a great deal of tar on hand, a steam injector was used to spray tar into the furnace, one at each port. Each pound of tar has the calorific power of 24.5 cubic feet of oven gas, and 1 pound was used to each 29 pounds of gas burnt. With this combination, or even by using tar alone, no difficulty was found in keeping the furnaces up to heat. The use of the tar was not economical, however, so that it was only used until sufficient gas producers could be built to supplement the heating power of the coke-oven gas. J. W. RICHARDS.

Iron and Steel Alloys. BY R. A. HADFIELD. *Iron and Steel Metallurgist*, January, 1904.—A review of the effects of carbon, silicon, aluminum, chromium, nickel, tungsten, cobalt, copper, titanium, molybdenum and vanadium on the properties of iron. Tests on cobalt steel are published here for the first time, with up to 7 per cent. cobalt, showing results similar to nickel steel, the best all around being the 2.5 per cent. alloy, containing also 0.38 per cent. carbon, 1.21 per cent. silicon, 0.14 per cent. sulphur, 0.65 per cent. manganese, and 0.07 per cent. phosphorus, and showing 38 tons elastic limit, 52 tons breaking strength, and 15 per cent. elongation on an unannealed bar. The author considers vanadium inferior to chromium as an alloying element. Several valuable tables are given. J. W. RICHARDS.

Alternate Bending Stresses in Steel. By C. B. Dudley. *Iron and Steel Metallurgist*, February, 1904.—When subjected to such stresses, the greater the difference between the maximum iber stress and the ultimate tensile strength, the longer the life; . stiff steel resists alternate bending stresses of a given fiber stress better than a tougher, softer steel.

J. W. Richards.

Ferro-nickel Direct from Pyrrhotite. By E. A. Sjöstedt. *Iron Age*, February 18, 1904.—See this Journal, **26**, R 305.

J. W. Richards.

Platinum in British Columbia. By R. W. Brock. *Eng. Min. J.*, February 18, 1904.—The writer made tests of the ores f the contact mines, in Burnt Basin, Yale district. The veins re in greenstone, between large porphyry dikes; the quartz is milky and has small amounts of pyrite, galenite, blende, molybenite and gold scattered through it. The principal value is in old. The mother lode was found to contain 0.1 ounce of platinum per ton; the dump from the same, 0.05 ounce; intersection f cross-cut with upper vein, 0.06 ounce; outcrop of lower vein, one; as high as 0.25 ounce was found in picked samples. The latinum is probably held by the sulphides, as is the gold.

J. W. Richards.

The Production of Iron Ores in 1902. By John Birkinbine. *U. S. Geol. Survey. Advance Extract from Mineral Resources of the U. S. for 1902*, 37 pp.—The usual numerous average cargo analyses of Lake Superior ores are given in this report.

W. F. Hillebrand.

ORGANIC CHEMISTRY.

A Chemical Study of the Seed of Rhus Glabra. By G. B. Frankforter and A. W. Martin. *Am. J. Pharm.*, **76**, 151–58.—The seed used in the experiments was gathered about September 1, after it had become fully matured and the husk had begun to dry. I. *Experiments on the Whole Seed*: *Moisture*, 6.86 per cent.; *ash*, 2.65 per cent., this high figure being due to dust collected by the pubescence of the husk; *total acidity* of the aqueous extract, equivalent to 0.059 gram sodium hydroxide, nearly all of which came from the husk. The seed was extracted with ether, alcohol and water, in the order named. The *ether extract* amounted to 22.36 per cent., and consisted chiefly of an oil and a reddish solid, the latter giving tests for tannic acid. The *alcoholic extract* (6.74 per cent.) yielded a dark, amorphous mass with an astringent and slightly acid taste, and contained a small amount of oil. The *aqueous extract* (4.76 per cent.), in addition to the bitter principle, contained an appreciable quantity of acid.

The separation of the whole seed showed it to consist of 60.1 per cent. seed and 39.9 per cent. husk. II. *Experiments on the Seed Proper*: *Moisture*, 4.93 per cent.; *ash*, 1.98 per cent.; *acidity*, about one quarter that of the unhusked seed; oil, 9.1 per cent. This oil is a light yellow mobile liquid, with a peculiar odor and a pleasant taste; its specific gravity at 20° C. is 0.9203, at 0° C. 0.9312. At —18° C. it becomes viscous, and at —24° C. is a solid. It is soluble in nearly all organic solvents, is optically inactive, its absorption spectrum is peculiar, and its index of refraction is 1.48821 at 0° C. and 1.48228 at 15° C. It is essentially a non-drying oil, its saponification figure lying between 190 and 200; iodine figure, 85.96–87.86; glycerol, 8.35–9.28 per cent.; unsaponifiable material (apparently one of the cholesterols), 0.6[illegible]96 per cent. III. *Experiments on the Husk*: On removing the husk and pubescence from the seed, the material thus obtained was of a reddish color, the coloring-matter being soluble in water, alcohol or ether. By extracting the husks with water, 7.32 per cent. of tannic acid was found, with 1.35 per cent. acid calcium malate, but no free malic acid. After extraction with water, the husk was dried, extracted with ether, and the ether evaporated. There was thus obtained on an average 8.5 per cent. of a black oil, of non-drying properties; specific gravity, 0.9412 at 20° C., 0.933 at 35° C.; iodine figure, 87.2; saponification value, 179. [illegible]7. By treatment with acetone, this dark-colored oil can be separated into a light yellow oil (80 per cent.), differing from the seed oil, and a black semi-solid insoluble substance. M. T. BOGERT.

Modern Synthetic Medicinal Products. BY VIRGIL COBLENTZ. *J. Soc. Chem. Ind.*, 23, 93–104.—A classification and critical review of those products which have appeared since 1898.
M. T. BOGERT.

A Method for the Detection of Certain Aldehydes and Ketones in Essential Oils. BY SAMUEL S. SADTLER. *J. Soc. Chem. Ind.*, 23, 303–305.—The author records his experience in extending his method of determining aldehydes and ketones (see this Journal, R. 166) to certain essential oils, giving the conditions necessary for securing the best results and calling attention to possible sources of error. He finds the method useful for the rapid assay of various essential oils, and also as a means of throwing light upon the nature of the aldehydic and ketonic bodies contained therein. M. T. BOGERT.

The Addition of Iodine and Potassium Iodide to Organic Compounds Containing the Carbonyl Group. BY A. M. CLOVER. *Am. Chem. J.*, 31, 256–268.—A number of substances containing the carbonyl group were found to give condensation products of definite composition with iodine and potassium iodide. A mixture of the carbonyl compound, iodine, and potassium iodide were heated to the melting-point for a few minutes. After cooling, the mass was crystallized from ether, chloroform or other similar solvent. Somewhat colored lustrous substances were obtained that were usually stable in dry air but decomposed slowly in solution. Benzophenone gave prisms of a golden luster, $(C_{13}H_{10}O)_9(KI)_2I_7.CHCl_3$ from chloroform solution and $(C_{13}H_{10}O)_9(KI)_2I_7.C_4H_{10}O$ from ether. The benzoic anhydride product was of a golden or steel-gray luster with probably the composition $(C_{14}H_{10}O_3)_{12}(KI)_4I_{11}$. Phthalic anhydride gave a lustrous green crystalline mass, $(C_8H_4O_3)_2.KI.I_4$. The phenylacetic anhydride derivative was unstable, decomposing on standing, composition $(C_{16}H_{14}O_3)_5(KI)_3I_{15}$. The succinic anhydride derivative was even more unstable, of a golden luster, and probably represented by the formula $C_4H_4O_3.KI.I_2$. The power to form these compounds evidently depends upon the carbonyl group which is common to anhydrides and ketones. Other substances containing this group were found to form such compounds while with ethers, alcohols, and phenols they could not be obtained. V. J. CHAMBERS.

On Tetrachlordinitrobenzol. BY C. LORING JACKSON AND H. A. CARLTON. *Am. Chem. J.*, 31, 360–386.—The tetrachlordinitrobenzene having the structure Cl 1,3,5,6.NO_2.2,4. was prepared and its properties studied. With aniline it gave 6-chlor-1,3,5,trianilino-2,4-dinitrobenzene. This anilino compound showed a strong tendency to form addition compounds similar, apparently, to salts with water of crystallization. With benzene, two compounds were formed containing, respectively, 1 and 2 molecules of the anilino compound to one of benzene. Toluene, acetic acid, and chloroform formed one compound each, all but the last being stable in the air. The action of sodium ethylate on tetrachlordinitrobenzene consists of two simultaneous reactions:

$$C_6Cl_4(NO_2)_2 + 3C_2H_5ONa = C_6(C_2H_5O)_3Cl(NO_2)_2 + 3NaCl.$$
$$C_6Cl_4(NO_2)_2 + 2C_2H_5ONa = C_6Cl_4(C_2H_5O)_2 + 2NaNO_2.$$

With sodium malonic ester the tetrachlordinitrobenzene gave trichlordinitrophenylmalonic ester. On distilling this with steam, the residue contained a product giving analytical figures corresponding to trichlordinitrophenylacetic ester, which in turn saponified to a body provisionally named trichlordinitrophenylacetic acid. EXPERIMENTAL.—*Trichlortrinitrobenzene* was prepared by boiling trichlordinitrobenzene with a mixture of concentrated sulphuric and fuming nitric acids. It crystallizes from alcohol and melts at 187°. *Tetrachlordinitrobenzene* was prepared from aniline: $C_6H_5NH_2 \xrightarrow{\text{Cl in } CH_3\text{ Cl sol.}} C_6Cl_3H_2NH_2 \xrightarrow{\text{Sandmeyer}} C_6H_2Cl_4 \xrightarrow{\text{fuming } HNO_3} C_6Cl_4(NO_2)_2$; thick, white, rhombic plates, m. p. 162°, insoluble in water, slightly so in alcohol, but easily in most other organic solvents; a very stable substance. When heated with aniline it formed *chlortrianilinodinitrobenzene*, a red substance, m. p. 179°, stable, solubilities about the same as tetrachlordinitrobenzene, and forming the following crystalline addition products: With benzene, $C_6(C_6H_5NH)_3Cl(NO_2)_2.C_6H_6$, dark crimson plates, losing benzene at 100°, and $[C_6(C_6H_5NH)_3Cl(NO_2)_2]_2.C_6H_6$, orange-colored crystals; with toluene, $[C_6(C_6H_5NH)_3Cl(NO_2)_2]_2C_7H_8$, orange needles, stable at ordinary temperatures but losing toluene on heating; with acetic acid, $C_6(C_6H_5NH)_3Cl(NO_2)_2.C_2H_4O_2$, orange needles that lose acetic acid on heating; with chloroform, dark red, narrow prisms, losing chloroform at ordinary temperatures but probably $C_6(C_6H_5NH)_3Cl(NO_2)_2CHCl_3$. The constitution of chlortrianilinodinitrobenzene was proven as follows: The NH_2 of tribromaniline was replaced by chlorine giving 1,3,5-tribrom-6-chlorbenzene; nitration gave 1,3,5-tribrom-6-chlor-2,4-dinitrobenzene; treatment with aniline gave 1,3,5-trianilino-6-chlor-2,4-dinitrobenzene which was identical with that from tetrachlordinitrobenzene. The *tribromchlordinitrobenzene* crystallized in prisms, m. p. 208°. An anhydrous benzene solution of tetrachlordinitrobenzene, when treated with a fresh solution of sodium ethylate in the cold, gave a reaction product that contained *chlordinitrophloroglucinol triethyl ether*, needles, m. p. 76°, and *chlordinitrophloroglucinol diethyl ether*, yellow needles, m. p. 102°–103°. The ammonium salt of the latter gave precipitates with barium chloride, lead acetate, and ferric chloride. When a stronger solution of sodium ethylate was used, the temperature allowed to rise and the reaction product afterward boiled, the substances that were isolated were the above chlordinitrophloroglucinol diethyl ether and *tetrachlorresorcinol diethyl ether*, slender white needles, m. p. 73°. The tetrachlordinitrobenzene and sodium malonic ester gave a small yield of *trichlordinitrophenylmalonic ester*, white prisms, m. p. 82°. A larger yield of *trichlordinitrophenylacetic ester*, white needles, m. p. 87°–88°, was also obtained but the authors were unable to determine whether this was formed as a primary product or secondarily, by decomposition of the above malonic ester. The phenylacetic ester, on saponification with an excess of dilute sulphuric acid, gave *trichlordinitrophenylacetic acid*, white crystals, m. p. 190°–191°. It is not soluble in cold sodium hydroxide solution, but is when the solution is warm. Long boiling with alcohol does not apparently convert it into an ester or a substituted toluene. Its ammonium salt gave precipitates with soluble ferric, lead and silver salts; also crystalline salts with copper, cobalt and nickel.

V. J. CHAMBERS.

BIOLOGICAL CHEMISTRY.

A Biological Examination of Distilled Water. By E. P. LYON. *Biol. Bull.*, 6, 198–202.—Tap-water is decidedly, although variably, toxic to *arbacia* larvae. The toxicity is not lost by sterilization, but is much reduced by boiling for some time. Water from automatic stills is toxic. Commercial distilled waters are often highly toxic. In distilling water from glass, the first one-tenth distilled over was decidedly toxic, the second less so, the third still less, and the fourth was of good quality. The best distilled water was produced by double distillation in glass, the first fourth distilled over in each distillation being rejected. Nearly as good water was produced by single distillation from tap-water to which sulphuric acid and potassium dichromate had been added. It was noted in several cases that *arbacia* lived longer in an artificial sea-water prepared from a good quality of distilled water than in natural sea-water. It is probable that the volatile toxic substance (ammonia ?) exists in sufficient quantity in sea-water to have an appreciable effect. F. P. UNDERHILL.

A Study of the Blood of Normal Guinea-Pigs. BY SAMUEL HOWARD BURNETT. *J. Med. Research*, XI (new series VI), 537–551.—In the circulating blood of full-grown, supposedly normal guinea-pigs, the red corpuscles were found to average 5,276,000 per cubic millimeter. The average per cent. of hemoglobin was 94.5. The average specific gravity was 1.053. The average number of leucocytes was 10,897 per cubic millimeter. Five varieties of leucocytes were found in the peripheral blood, lymphocyte, large mononuclear, polynuclear, eosinophile, and mast cells. F. P. UNDERHILL.

Observations upon the Chromatic Variations in the Precipitated and Sedimented Chlorides, Sulphates and Phosphates. BY EDWARD F. WELLS AND JOHN C. WARBRICK. *Am. J. Med. Sci.*, 127, 847–851.—An investigation seeking to discover the reason for the varying colors observed in the precipitated and sedimented chlorides, sulphates, and phosphates from about 2000 urines, including normal and pathologic conditions. The cause was not explained.

F. P. UNDERHILL.

Upon the Production and Properties of Anti-crotalus Venin. BY SIMON FLEXNER AND HIDEYO NOGUCHI.—The local lesions caused by crotalus venom interfere with the employment of the venom in an unmodified form for purposes of immunization. Hitherto no practically successful production of antitoxin for rattlesnake venom has been accomplished because no method has been known by which the local effects of the venom could be removed, without, at the same time, rendering the venom useless for purposes of immunization. The modification of venom by means of heat reduces or abolishes the activity of the venom at the expense of the hemorrhagin and possibly other locally acting principles. In order to produce an antitoxin for crotalus venom, the attempt was made to transform the locally active principles of the venom into toxoid modifications. That such transformation can be effected, is shown by the manner of action of rattlesnake venom which has been treated with hydrochloric acid and iodine trichloride. Through the use of these agents the venom is deprived of a large part of its toxicity, while it still preserves the power to set up anti-venin formation in the rabbit and dog. An anti-venin of considerable activity against rattlesnake venom can be produced in this manner. Anti-crotalus venin is without appreciable antitoxic power over cobra and daboia venoms, and of imperfect antitoxic power over water-moccasin venom, in keeping with the different constitutions of these venoms, for the first owe their toxicity to neurotoxins and hemolysins, the last to these principles together with hemorrhagin. The anti-crotalus venin is effective only when the hemorrhagin is present in such quantity in venom as to make it an element of considerable toxicity. Precipitins are formed from venom along with or independent of the immunizing principles for venom. There is no relation between the degree of protection afforded by and the amount of precipitin present in the immune serum. Precipitins may arise in treated animals, even when the modified venoms are incapable of provoking the production of immunizing substances. Precipitins for the different venoms—crotalus, cobra and daboia—are highly, although not altogether absolutely, specific.

F. P. UNDERHILL.

The Products of Glycolysis in Blood and Other Animal Fluids. BY A. E. AUSTEN. *Am. J. Med. Sci.*, **127**, 832–841.—The experiments tend to show that there is no evidence to substantiate the view that the dextrose of blood is converted into glycuronic acid by means of a glycolytic ferment present in the blood. The large amount of dextrose that disappears from blood upon standing is not converted into carbon dioxide or oxalic acid. What becomes of it is still unknown.

F. P. UNDERHILL.

Contributions to the Study of Hemagglutinins and Hemolysins. BY W. W. FORD AND J. T. HALSEY. *J. Med. Research*, XI (New Series, VI), 403–426.—The conclusions drawn from this research are as follows: The employment of the constituents of the blood corpuscles of one species of animal, laked blood and stroma, for the injection of other species of animal results in the production of definite specific bodies—lysin and agglutinins. In a strongly hemolytic serum the rapid solution of the corpuscles marks the appearance of the agglutination, which may be demonstrated in preparations kept on ice at 3° C., or by use of the inactivated serum. In an immune serum, capable of uniting in high dilutions with erythrocytes originally employed, the lysis in these dilutions is frequently absent, even though agglutination takes place, owing to the lack of sufficient complement in the diluted serum. The addition of excess of complement, in the shape of fresh normal serum, always avails to cause the solution of the corpuscles in the same dilutions in which they are agglutinated. Bordet's view that the stroma is responsible for the lysis and Nolf's view that the stroma is responsible for the agglutination and the laked blood for the lysis are both confirmed by the demonstration of both agglutination and lysis from the injection of both laked blood and stroma. Contrary to Van Dungern's view, the splitting up of the blood corpuscles by the use of distilled water does not result in the destruction of the substances in the corpuscles producing lysis and agglutination. Finally, the phenomena of agglutination and lysis cannot be separated from each other by the injection of the constituents of the blood corpuscle, but these phenomena seem to be inseparably connected. F. P. UNDERHILL.

The Rhythm of Immunity and Susceptibility of Fertilized Sea-urchin Eggs to Ether, to HCl and to Some Salts. BY E. G. SPAULDING. *Biol. Bull.*, 6, 224–241.—The conclusions drawn from this research are that there is a pronounced rise in immunity of fertilized sea-urchin eggs to ether up to either just before or the beginning of segmentation. A sharp decrease then occurs, followed by a sharp rise toward the end of the cleavage. A repetition of this occurs at the second segmentation. Similar changes are found resulting from the use of hydrochloric acid, potassium chloride and sodium chloride, with the difference that the fall in immunity comes somewhat earlier with potassium chloride than with hydrochloric acid and with this than with ether. The marked decrease in immunity "at cleavage" caused by the agents named above seems to be explainable on the basis that all augment beyond a certain point the increase in osmotic pressure normally necessary for cleavage. F. P. UNDERHILL.

The Limitations of Chemistry in Infant-feeding. BY HENRY DWIGHT CHAPIN. *N. Y. Med. J.*, 79, 776–779.—An article, the object of which is not to disparage the chemical analysis of foods, but rather to show that food chemistry has limitations in practical feeding. The advances made in infant-feeding have been greater along lines of physiologic adaptations of various milks to the feeding requirements rather than from exclusive chemical studies. F. P. UNDERHILL.

The Hopkins-Folin Method for the Determination of Uric Acid in Urine. BY W. E. DREYFUS. *N. Y. Med. J.*, 79, 836.—A recommendation for the use of this method. F. P. UNDERHILL.

Preliminary Note Concerning the Reduction of Diabetic Glycosuria with Pancreas-haemoglobin-muscle Extract. BY A. C. CROFTAN. *N. Y. Med. J.*, 79, 882–884.—Pancreas-haemoglobin-muscle extract administered *per os* to diabetic patients causes a decrease in the quantity of sugar eliminated in the urine. F. P. UNDERHILL.

On the Occurrence of Lipase in the Urine as a Result of Experimental Pancreatic Disease. BY ALBION WALTER HEWLETT. *J. Med. Research*, XI (New Series, VI), 377–398.—It is possible to show the presence of lipase in the urine and to roughly estimate the quantity present. Very little, if any, lipase is present in normal urine. Lipase appears in the urine after a variety of insults to the pancreas of dogs. It was found in greatest amount as a result of experimental acute hemorrhagic pancreatitis. It was also found over a period of from three to five days after obstruction of the pancreatic duct. It is probable that severe pancreatic trauma may cause the appearance of lipase in the urine. The conditions are those in which fat necroses are most apt to occur in human pancreatic disease. F. P. UNDERHILL.

The Composition of Zygadenus Venenosus and the Pharmacological Action of Its Active Principle. BY M. VEJUX-TYRODE. *J. Med. Research*, XI (New Series, VI), 399–403.—The plant *zygadenus venenosus* contains a wax-like body: a crystalline neutral substance, an oil, a gum and two resins. The wax-like body is crystalline, insoluble in water, soluble in cold alcohol with difficulty, but readily soluble in hot alcohol, chloroform and ether. It melts at 74° C. and contains 81.06 per cent. carbon, 13.23 per cent. hydrogen and 4.71 per cent oxygen. Its molecular weight is 638, and it has a formula of $C_{44}H_{88}O_2$. It is inactive. The crystalline neutral body, *zygadinin*, is also inactive. It separates from ether in large, transparent prisms which are soluble in alcohol, ether, chloroform, soluble with difficulty in petroleum ether, and insoluble in water, acids and alkalies. Its melting-point is 134° C. It contains no nitrogen, yields no glucose on boiling with acids, and contains 82.50 per cent. carbon, 11.72 per cent. hydrogen and 5.78 per cent. oxygen. The gum and oil are also inactive. One of the resins, *zygadinon*, produces all the symptoms of the crude drug; when treated with baryta water it yields a basic body, *zygadinein*, and an acid, *zygadinic acid*. Zygadinic acid in small doses is without effect upon frogs. Larger doses, 0.025 gram, produce decreased reflexes and narcosis from which the frogs usually recover. Zygadinein is a light yellowish body, readily soluble in chloroform, but soluble with difficulty in alcohol. It is contained to the extent of about 20 per cent. in zygadinon. It has an alkaline reaction to litmus but not to phenolphthalein, and melts at 102° C. It combines with acids, and these compounds are soluble with difficulty in water, but readily soluble in alcohol. In frogs it produces a veratrine-like action. In dogs the striking symptoms are tremendous and persistent

vomiting, staggering gait, salivation, decreased sensation, complete paralysis and death. The other resin has practically the same properties as zygadinon, but its toxic action is not so great.
F. P. UNDERHILL.

Who is Underfed? BY HEINRICH STERN. *N. Y. Med. J.*, 79, 811–812.—A résumé of the necessary requirements (together with experimental results) for perfect metabolic equilibrium and the possession of strength and endurance necessary for the fulfilment of one's vocation. F. P. UNDERHILL.

The Herter Lectures. *Abst. Boston Med. and Surg. J.*, 150, 443–450.—Abstracts of the lectures delivered by Prof. Ehrlich on "The Mutual Relations between Toxin and Antitoxin," "Physical Chemistry *versus* Biology in the Doctrines of Immunity," and "Cytotoxins and Cytoxic Immunity" before the Medical Department of Johns Hopkins University, April 12, 13, 14, 1904.
F. P. UNDERHILL.

Ammonium Sulphocyanate and Thiourea as Sources of Nitrogen to Fungi and Micro-organisms. BY J. H. KASTLE AND ELIAS ELVOVE. *Am. Chem. J.*, 31, 550–558.—This investigation was carried out in order to determine to what extent the nitrogen of ammonium sulphocyanate and thiourea is available for the life and growth of fungi and micro-organisms, and also to what extent discrimination could be made between these isomers by biochemical methods. It was found that the nitrogen of ommonium sulphocyanate is available to certain fungi and micro-organisms, but that of thiourea is not. F. P. UNDERHILL.

The Nature of the Principal Phosphorus Compound in Wheat Bran. BY A. J. PATTEN AND E. B. HART. *Am. Chem. J.*, 564-572.—See this Review, p. 312. F. P. UNDERHILL.

The Hydrolysis of Ethyl Butyrate by Lipase. BY J. H. KASTLE, MARIUS EARLY JOHNSON AND ELIAS ELVOVE. *Am. Chem. J.*, 31, 521–550.—In the previous work carried out by Loevenhart and Kastle (*Am. Chem. J.*, 24, 491–525), along similar lines, impure solutions of lipase were employed. In the present research new methods have been used by means of which a clear solution of lipase still possessing considerable activity may be obtained. The clear solutions are very stable and may retain their activity for several months. Animal lipase belongs to the class of ferments that are retained by the walls of the porous cup. The hydrolysis of ethyl butyrate by lipase is evidently a monomolecular process which is influenced to a slight extent by one of the products of the change—the acid. Alcohol slightly retards the action of the ferment, but with the small quantities of this substance resulting from the hydrolysis of dilute solutions of the ethereal salt its effect is so slight as to be altogether negligible. The average mean ratio of velocities for the reaction (the hydrolysis of ethylbutyrate by lipase) at the several intervals of temperature was found to be 1.69. Lipase suffers no permanent alteration while affecting the hydrolysis of the ethereal salt, but it retains its complete activity regardless of the amount of substance that it has previously hydrolyzed. In this sense lipase belongs to the class of true catalyzing agents. Lipase acts more rapidly in a neutral or slightly alkaline than in an acid medium. The amount of ethyl butyrate hydrolyzed by lipase is, within certain limits, independent of the concentration of the ethereal salt. Lipase far exceeds both caustic soda and hydrochloric acid in its power to hydrolyze ethyl butyrate in dilute solution. Lipase is probably of a basic nature. F. P. UNDERHILL.

The Chemistry of Malignant Growths. First Communication. BY S. P. BEEBE. *Am. J. Physiol.*, 11, 139–145.—This paper deals with an experimental study of the chemical composition of tumors. Several forms were studied and the products of proteolysis (leucin, tyrosin, glycocol, etc.) were separated. The tissues were sterile in each case. The degeneration noticed must have been one of autolysis. The reason the products are found in such abundance may be ascribed to impaired circulation. F. P. UNDERHILL.

An Experimental Study of the Rhythmic Activity of Isolated Strips of the Heartmuscle. BY E. G. MARTIN. *Am. J. Physiol.*, 11, 103–139.—A study of the results recorded in this article leads to the conclusion that the simple theories thus far proposed in explanation of the reactions of ventricular tissue in salts, in which all the effects observed are attributed to mere diffusion inward or outward of one salt or another, are insufficient to account for all the phenomena, and that the ultimate explanation of these effects will prove to be more complicated. The author puts forth a hypothesis to account for all the known phenomena. It is assumed that the liberation of energy in ventricular tissue is dependent upon the presence in it of calcium in diffusible form but that the normal calcium content of the tissue is for the most part in some indiffusible form. According to this assumption, one effect of stimulation upon the tissue would be to convert the calcium from its indiffusible inert form to a diffusible active form. When a strip of ventricle is isolated from its normal connections, it may be supposed that the calcium content passes over gradually from the inert to the active form, perhaps through the action of sodium salts upon the tissue, and that activity begins when sufficient diffusible calcium has accumulated to produce its effect. Although the assumed active calcium has been designated as diffusible, a satisfactory explanation of some of the observed phenomena requires the assumption that the actual diffusion of calcium is comparatively insignificant when the tissue is at rest, but marked when it is in action. F. P. UNDERHILL.

On the Action of Lobeline. By Charles W. Edmunds. *Am. J. Physiol.*, 11, 79–103.—In frogs, lobeline causes some excitation, followed by depression of the central nervous system, with lack of muscular co-ordination, and, later, a total loss of reflexes, and paralysis due to a curari-like action on the motor terminations. If the animal recovers, it occasionally exhibits marked reflex excitability. On the hearts of cold-blooded animals (frogs and turtles), in addition to a nicotine-like action, lobeline also acts on the heart-muscle directly, and inhibits the action of such a drug as muscarine. In larger doses the heart-muscle is depressed, weakening and slowing the contractions. In warm-blooded animals (cats and dogs), the main effects of small doses are due to the powerful emetic action of the drug, most of the symptoms being secondary to the vomiting, which is due to action on the medulla. In larger doses muscular twitchings are followed by tonic convulsions and death. The drug is a powerful respiratory stimulant in small doses, and in large quantities causes death by paralyzing the respiratory center. Stimulation of the vagus nerve has no effect on the bronchial muscles after lobeline. The effects of the drug upon the rate of the mammalian heart, the height of the blood-pressure, the circulation in the abdominal viscera and in the ear (rabbits), the changes in the pupil and the submaxillary gland may all be explained by a primary stimulation and final paralysis of the various sympathetic ganglia controlling these functions. Lobeline paralyzes the superior cervical, the vagus, and the renal ganglia more easily than it does the inferior cervical and the mesenteric ganglia. Tolerance to the drug could not be gained in cats.

F. P. Underhill.

Studies in Body-temperature. I. Influence of the Inversion of the Daily Routine; the Temperature of Night-workers. By Francis Gano Benedict. *Am. J. Physiol.*, 11, 145.—The results thus far obtained show that there is no tendency to an inversion of the temperature-curve by inverting the daily routine of life. Further, it is seen that while years of night-work have not succeeded in eliminating the tendency to an evening fall, a minimum some time during the night, and the morning rise, the whole course of the curve is markedly different from any with which one is familiar. F. P. Underhill.

On Dynamic Conditions Which Are of Importance in the Determination of the Morphological Polarity of Organisms. By Jacques Loeb. *Pflüger's Arch.*, 102, 152–163.—Previous experiments have shown that the polarity observed in the regeneration of tubularia is not to be referred to a morphologic polarity of individual cells, but rather to a process that is comparable according to the variety to a current from the aboral to the oral pole. This led to the supposition that a ligature tied about the middle

of the stem might do away with the polarity. This supposition, when subjected to experimental study, was found to be correct. Further experiments on this subject are now in progress on other organisms.
F. P. UNDERHILL.

PHARMACEUTICAL CHEMISTRY.

Calcium Glycerophosphate. BY H. R. EIGELBERNER. *Am. J. Pharm.*, **76**, 212. — Glycerophosphoric acid was discovered in 1840 by Pelouse, who made it from anhydrous phosphoric acid and glycerin. The salts of this acid were not used in medicine until 1894. The acid may be made by heating for six days at a temperature of 100°–110° C., 3 kilos of 60 per cent. phosphoric acid and 3.6 kilos of glycerin. After cooling, the newly formed acid is neutralized with successive portions of a mixture of calcium carbonate and water. It is then treated with alcohol and recrystallized. Although soluble in 15 parts of cold water it is almost insoluble in boiling water.

The theoretical amount of calcium oxide in this salt is about 22.66 per cent., and this furnishes a basis for the estimation of the preparation. The amount of lime will vary, depending upon whether or not all of the phosphoric acid combined with the glycerin in the manufacture of the glycerophosphoric acid. An English brand contained 33.05 per cent. of calcium oxide, while the other samples had 21.6 and 22.5 per cent. W. H. BLOME.

The Italian Olive Oil on the American Market. BY A. AUGUSTO. *Am. J. Pharm.*, **76**, 219.—The old method of obtaining the oil still furnishes the best product. The olives, before they are ripe, are picked, ground and expressed, 20 to 25 bushels yielding about 12 gallons of oil. The oil is allowed to stand, during which time the impurities separate, and with the coming of warm weather the oil becomes clear. The best qualitative tests, according to the author, are the appearance, odor and taste of the oil. Much of the so-called Italian olive oil is manufactured in New York. W. H. BLOME.

Best Method of Preparing and Preserving Syrup Hydriodic Acid. BY A. B. RAINS. *Merck's Rep.*, **13**, 133.—The present official method of manufacturing this syrup is not entirely satisfactory. The use of alcohol and its subsequent evaporation by the application of heat induces partial decomposition as shown in the slight discoloration of the finished syrup. The author prepares a solution of hydriodic acid just ten times the strength of the U. S. P. syrup according to the following formula:

Potassium iodide	54 grams.
Potassium hypophosphite	4 "
Distilled water	64 cc.

Mix and make solution.

Crystallized tartaric acid	64 grams.
Distilled water	84 cc.

Mix and make solution.

Both solutions are boiled, the solution of the salts is poured into the solution of the acid, set aside until cool, then chilled to 36° F. when nearly all of the potassium bitartrate will have crystallized out, and is removed by filtration.

When it is desired to prepare a quantity of the syrup of hydriodic acid, one part of this 10 per cent. solution is diluted with nine parts of simple syrup. A sample prepared in this way, exposed to the light in a partially filled flask, kept perfectly for eight months, while a sample of the syrup, made according to the official process, kept in the same way, had a decidedly yellow tinge, indicating deterioration. W. H. Blome.

Beeswax and Its Adulterants. By F. J. Smith. *Merck's Rep.*, 13, 133.—But very few samples of beeswax are now obtainable on the market which will satisfactorily conform to the requirements of a pure wax, as the greater part of it is grossly adulterated. Adulterants that were formerly commonly used are mineral matter, sulphur, starch and flour, but as these are easily detected, they have given place to resin, pitch, stearic acid, mutton and beef tallow, stearin, Japan wax, paraffin, ozokerit and other similar substances. Pitch and resin render the wax too brittle, for which reason they are not much used.

The specific gravity and melting-point are sometimes of value in the examination of a suspected wax, although the skilful manipulator adjusts his mixtures so that they will closely conform to recognized standards. Wax adulterated with paraffin or ceresin generally has a low specific gravity. Hehner's test is suggested as being the best and most valuable one. Pure beeswax has a nearly constant composition, and the average total amount of potassium hydroxide required is 9.5 per cent. for complete saponification. The iodine value may be useful when applied along with other tests.

Of twenty-eight samples examined, ten contained ceresin or paraffin. Some contained, in addition, stearin, Japan wax or tallow to adjust the disturbed saponification number. In all, over 60 per cent. of the samples were adulterated in one way or another. W. H. Blome.

Research in Manufacturing Pharmacy. By Henry Kraemer. *Am. J. Pharm.*, 76, 214.—Several factors are at work to urge on the original investigator in his work. The man is honored in proportion to the nature and value of his accomplishments. At the present time several money prizes are available for such work. Opportunities to carry on research are offered by universities and manufacturing houses to capable men. Great discoveries have been made by men connected with universities, who often owed their success to the fact that manufacturing firms placed great quantities of material for the research at their disposal. Much good has resulted from the publication of investigations carried on in the laboratories of manufacturers by their own chemists. This is notably true of the semiannual reports of Schimmel & Co., the annual reports of Merck & Co., on "The Advancement of Pharmaceutical Chemistry and Therapeutics," and of "The Ephemeris of Materia Medica, Pharmacy, Therapeutics and Collateral Information," by E. H. Squibb. The most recent publication of this nature is the "Digest of Researches of Laboratory Workers," consisting almost entirely of abstracts of papers published by chemists employed in the laboratory of the Smith, Kline & French Co. W. H. Blome.

INDUSTRIAL CHEMISTRY.

Electrolysis and a Cure Therefor. By A. Ross Gra[illegible] *American Gas Light Journal*, April 11, 1904.—The writer states that if gas and water companies would devote more care toward making piping poorly conducting, by having insulating joints rather than bothering about the condition of rails in surface electric lines, electrolysis of pipes might be avoided. The system of connecting the pipes to the negative bus-bars of the generators only augments the difficulty. The author does not state what insulating material is used for the joints, but states that he has observed results with its use. S. P. Sadtler.

Storage of Bituminous Coal. By F. M. Griswold. *Eng. Min. J.*, May 5, 1904.—The quantity stored should not exceed 1,500 tons in any one pile, so as to allow of the free passing off of gases. Coal in piles of this size or less should not have a total height of more than 12 feet. There should be good ventilation when coal is stored under shelter. Wet coal should be spread out to expedite drying, especially when wet with snow or ice. All piles of coal should be "rod-tested" with frequency and regularity, and a temperature greater than 160° F. should not be exceeded. S. P. Sadtler.

The Utilization of Anthracite Culm for Producer Gas. By J. Gardner Sanderson. *Eng. Min. J.*, April 7, 1904.—In treating of the subject of using anthracite culm for producer gas engine plants, the author gives comparative analyses of gas as follows:

	Welsh anthracite. Per cent.	Pennsylvania anthracite buckwheat. Per cent.	Anthracite culm. Per cent.
Hydrogen	17.73	4.51	19.85
Marsh gas	0.62	1.79	0.66
Carbonic oxide	25.07	25.38	28.80
Carbonic acid	6.37	4.02	3.80
Nitrogen	48.90	64.04	46.49

The cost of operating the first with culm at 25 cents per ton, ould be $7.16 per horse-power year of 365 days. For the steam- wer plant, according to results of tests made by a committee the Scranton Engineers Club, the cost would be $22.22 per rse-power year of 365 days.

S. P. SADTLER.

Binders for Coal Briquettes. BY ROBERT SCHORR. *Eng. in. J.*, April 7, 1904.—Germany leads the world in the man- acture of fuel briquettes, chiefly because of the large beds of nite. It has been retarded in America chiefly because of: (1) he cheapness of good mine-run coal; (2) the high price and nited supply of material for binders; and (3) the discovery of el oil where coal is expensive. The largest fuel-briquetting orks in this country are those of the San Francisco and San achim Coal Co. at Stockholm, Cal., where there are two presses, ch capable of turning out 180 to 220 tons of ball-shaped bri- ettes every twenty-four hours. Soft asphaltum pitch and oil siduum are used as binder and lignite, with a certain percentage bituminous coal, as raw material. The sizing should run be- een 1/4 inch and 3/32 inch to make a good burning briquette. The h content should not exceed 6 per cent. Some fat bituminous als can be briquetted without a binder. Anthracite can be bri- etted with soft pitch, but some bituminous coal should be used give coking qualities: A good binder should increase the rning and calorific qualities, be free from ash and make a solid d waterproof briquette. For these reasons, organic substances e preferable to inorganic. Coal tar and pitch are most used, but ould not be too soft, as the briquettes will fuse together and use a dense smoke. Starch and starch-containing substances, ch as spoiled potatoes, grain, etc., have been used, partly de- mposed sea-weed and cheap beet-sugar molasses, but these as ll as the starch binders are liable to soften by getting wet and ve to be used with linseed oil. Water-glass is the most promi- nt inorganic binder, clay, lime, gypsum and cement being also ed. One per cent. of silicate of soda with coal fines makes a od briquette. The use of 5 per cent. of magnesia cement makes strongest binding. A good magnesia cement consists of 30 rts of a 45 per cent. magnesium chloride, 20 parts of 93 per nt. magnesium oxide, and 60 parts of water. The magnesia ould be mixed dry with the coal, the magnesium chloride ould be dissolved in the water and thoroughly incorporated and essed at about 2,000 to 3,700 pounds per square inch. The ficulty with these briquettes is their high ash content.

S. P. SADTLER.

Acid-making from Pyrrhotite. BY ERNST SJÖSTEDT, Sault . Marie, Ontaria, Can. *Canadian Mining Review*, April, 4.—The Sudbury pyrrhotite (Fe_6S_7), containing 15–20 per cent. phur, 1–3 per cent. nickel, and 0.5–2 per cent. copper, the rest being iron gangue, is the starting point of the work of roasting, which has not been successfully accomplished up to the time of this undertaking. The ore was first concentrated by crushing and sorting. Two ores were thus obtained, one high in copper and gangue and low in sulphur to be used in ordinary matte smelting, and the other low in copper and gangue but high in sulphur and nickel to be used in the acid plant. This latter ore averages about 28 per cent. sulphur, 3 per cent. nickel, 0.5 per cent. copper and 50 per cent. iron. The sulphur was to be roasted and the sulphurous acid used for making a bisulphite liquor for a sulphite-pulp plant and for making sulphuric acid.

Roasting.—This was only found possible in a modified Herreshoff furnace with the ore in powdered form. The modifications consisted in: (1) Minimizing the heat of radiation; (2) application to best advantage of the roasting heat generated; (3) exclusion of all the extraneous air possible; (4) The application of an auxiliary heat supply in case of need. These points were practiced as follows: (1) The combination of four single furnaces in one battery, disposed equidistant from a common center; (2) a minimum distance between the floor and roof arch; (3) a round rabble arm, with a secure locking device to prevent inflow of air, the air for combustion being admitted through special pipes, provided with valves; (4) separate muffle chambers for the auxiliary heat. Four batteries of kilns have been built (16 units) with a total capacity of 40 tons of ore a day and a crushing plant of one 24-inch by 15-inch jaw mill, and two 36-inch rolls to pulverize 80 tons of ore per shift of ten hours; also, two Dellwick-Fleischer No. 4 water-gas generators, each with a capacity of producing 20,000 cubic feet of water-gas per hour; also, three 95 horse-power general electric motors for supplying the required power.

The Roasting Gas.—Water-gas was at first used for auxiliary heating but by care it was found unnecessary, even when the sulphur fell to from 20–25 per cent., to give gas of requisite strength in sulphur dioxide (6–10 per cent.). During two weeks, 210 tons of pyrrhotite, containing 111,112 pounds of sulphur were treated, and 191,917 pounds of sulphur dioxide recovered, thus obtaining an efficiency of 86 per cent. The average working cost, exclusive of heating and lighting, amounted to $1.86 per ton of ore treated.

Labor	$1.12	Crushing	$0.50
Power	0.24	Roasting	0.75
Repairs and sundries	0.50	Returned and sent	0.61
	$1.86		$1.86

Counting cost of ore, etc., the sulphur recovered cost $6.00 per ton of sulphur dioxide or $12.00 per net ton of sulphur. When the pyrrhotite ran poorly in composition, some pyrite was used.

The Bisulphite Liquors.—These were made by passing the sulphurous acid gas through towers packed with dolomitic limestone over which water was run. A solution of acid bisulphite of lime and magnesia was obtained containing 4 per cent. of sulphur dioxide and 1 per cent. of lime. For such a liquor a minimum of 5 per cent of sulphur dioxide in the washing gas is required.

The Liquid Sulphur Dioxide Plant.—The sulphur dioxide is taken up by water, then expelled by boiling, dried and compressed. The requisites for economical liquefaction are: (1) A strong gas (no leaks in flues); (2) an effective cooling and cleaning system; (3) cold water for absorption and cooling; (4) large absorption towers; (5) an economical heating exchange (counter current); (6) cheap fuel and economical heating and concentrating systems; (7) ample compression capacity.

Conclusions.—"From the data above given we find that pyrrhotite not only can be burned without special fuel, but also made to yield a sufficiently strong sulphur dioxide gas for the sulphite pulp industry, for liquefaction and for the manufacture of sulphuric acid. S. P. SADTLER.

AGRICULTURAL CHEMISTRY.

The Digestive Action of Milk. BY H. SNYDER. *Minn. Agr. Expt. Sta. Bull. No.* **86**, pp. 234–237.—In earlier work at the station it was found that the addition of milk to a ration increased to a considerable extent the digestibility of the protein, and that milk rendered some of the proteids of bread soluble. Further studies have been conducted to determine the cause of this solvent action, from the results of which the conclusion is drawn that neither the small amount of free acid in fresh milk nor the alkaline salts in the proportion found in milk have any marked solvent action on the proteids. Milk rendered from 1 to 3 per cent. of the total proteids of wheat soluble, and this action was not interrupted by the addition of chloroform or ether. The solvent action of fresh milk is therefore believed to be due to a trypsin-like enzyme normally present in the milk. H. W. LAWSON.

Milk. BY T. MACFARLANE. *Lab. Inland Revenue Dept. Ottawa, Canada, Bull. No.* 93, 15 pp.—Of 227 samples of milk collected in November and December, 1903, and analyzed, 159 samples were found unadulterated. H. W. LAWSON.

The Moisture Content of Butter and Methods of Controlling It. BY G. L. MCKAY AND C. LARSEN. *Ia. Agr. Expt. Sta. Bull. No.* **76**, pp. 135–166.—Conditions influencing the moisture content of butter were studied experimentally. The most important factors were found to be temperature, degree of churning, and thickness of cream. By proper attention to these conditions it has been found possible to incorporate 18 per cent. or more of moisture without apparent injury to the commercial quality of the butter. Special tests are even necessary to detect a moisture content of 20 per cent. when the moisture has been properly incorporated. The authors state that they do not favor an excessive amount of moisture in butter ; nevertheless, they would come as near as possible to 16 per cent. which has been quite generally accepted as a maximum standard of moisture. The trend of the bulletin is apparently in favor of incorporating more moisture in butter than is usual, and while the methods employed by the authors will doubtless accomplish this, it is by no means clear from the data presented that they have devised a method whereby the moisture content may be accurately controlled under practical conditions. H. W. LAWSON.

Studies upon the Keeping Quality of Butter. BY L. A. ROGERS. *U. S. Dept. Agr., Bur. Animal Ind. Bull. No.* 57, 24 pp.—This work was done entirely with canned butter. Old samples from several sources possessed a disagreeable flavor and showed a high acid number. Bacteria were practically absent. Two lots of freshly canned butter were kept at room temperatures and examined at frequent intervals. The gradual development of a disagreeable fishy flavor and a strong penetrating odor were closely associated with an increase in the acid number. The lactic acid bacteria and other micro-organisms present at the outset practically disappeared by the end of 100 days, while the change in flavor and acidity continued for about 200 days longer, indicating that the changes were brought about by the action of enzymes originally present in the milk, or developed subsequently in the milk or butter by the action of micro-organisms. Enzymic action was also shown by an increase in the acidity of butter treated with antiseptics to eliminate bacterial growth. Heating the milk or cream destroyed the enzyme, and the butter made under such conditions remained unchanged. H. W. LAWSON.

The Fat Testing of Cream by the Babcock Method. BY E. H. WEBSTER. *U. S. Dept. Agr., Bur. Animal Ind. Bull. No.* 58, 29 pp.—Extended observations have shown that the Babcock test is by no means universally employed in cream-testing with good results. Much of the difficulty is attributed to carelessness on the part of the user, but much is also considered due to improper instruction given for the use of the test as applied to cream. The author describes the test in detail, notes faults which have been observed, and makes suggestions with a view to the improvement of methods. The points especially emphasized are the obtaining of a true sample of the cream to be tested, an exact quantity of the sample in the test bottle, and an accurate reading of the test. Experimental work in regard to these points is reported and condensed directions for making fat tests of cream, based partly upon the results obtained, are given in the form of a summary of the bulletin. H. W. LAWSON.

Experiments on Losses in Cooking Meat, 1900-1903. BY H. S. GRINDLEY AND T. MOJONNIER. *U. S. Dept. Agr., Office of Expt. Stas. Bull. No.* 141, 95 pp.—This is a detailed report of 87 cooking experiments conducted for the purpose of determining the nature and character of the losses occurring in the cooking of meats. The methods of cooking compared were boiling, pan-broiling, sautéing, and roasting. The analyses of the meats are reported in detail and the methods employed are described. The work is presented as a report of progress, and is not considered sufficiently exhaustive to warrant making final deductions as to the losses and chemical changes involved in cooking meats. When beef was cooked in water 3.25 to 12.67 per cent. of the nitrogenous matter, 0.60 to 37.40 per cent. of the fat, and 20.04 to 67.39 per cent. of the mineral matter were found in the broth. When sautéed, 2.15 per cent. of the nitrogenous matter and 3.07 per cent. of the mineral matter were taken up by the fat in which the meat was cooked, while the cooked meat contained 2.3 times more fat than before cooking. When roasted, the drippings contained 0.25 to 4.55 per cent. of the nitrogenous matter, 4.53 to 57.49 per cent. of the fat, and 2.47 to 27.18 per cent. of the mineral matter present in the uncooked meat. In cooking meat in water at 80° to 85° C., the use of either hot or cold water at the start had little effect on the amount of material found in the broth. In the preparation of beef tea the meat lost much of the flavoring material, but comparatively little in nutritive value.
H. W. LAWSON.

The Food Value of Sugar. BY H. SNYDER. *Minn. Agr. Expt. Sta. Bull. No.* 86, pp. 225–233.—Two series of experiments, lasting 4 days each, were made with 3 men. In the first series the ration consisted of various foods with the addition of 5 ounces of sugar per day, and in the second series of the same foods without the addition of sugar. The results showed that 98.9 per cent. of the total energy of the sugar was available to the body. The addition of sugar to the ration was beneficial, increasing the available energy 25 per cent. without sensibly increasing or decreasing the digestibility of the other foods. The sugar also caused a retention of 25 per cent. more nitrogen in the body. The value of sugar in a ration is believed to depend upon its judicious use and combination with other foods. The carbohydrates supplied more than one-half of the total available energy.
H. W. LAWSON.

Breakfast Foods. BY F. W. ROBISON. *Mich. Agr. Expt. Sta. Bull. No.* 211, 25 pp.—The composition of foods and the

principles of nutrition are discussed in a popular manner and analyses of 48 cereal foods are reported. The author draws the following conclusions: "The breakfast foods are legitimate and valuable foods. Predigestion has been carried on in the majority of them to a limited degree only. The price for which they are sold is as a rule excessive and not in keeping with their nutritive values. They contain as a rule considerable fiber which, while probably rendering them less digestible, at the same time may render them more wholesome to the average person. The claims made for many of them are not warranted by the facts. The claim that they are far more nutritious than the wheat and grains from which they are made is not substantiated. They are palatable as a rule and pleasing to the eye. The digestibility of these products as compared with highly milled foods, while probably favorable to the latter, does not give due credit to the former, because of the healthful influence of the fiber and mineral matter in the breakfast foods. Rolled oats or oatmeal as a source of protein and of fuel is ahead of the wheat preparations, excepting of course, the special gluten foods, which are manifestly in a different class."
H. W. LAWSON.

Flavoring Extracts. BY A. MCGILL. *Lab. Inland Revenue Dept., Ottawa, Canada, Bull. No.* 89, 16 pp.—This gives the results of the examination of 68 samples of various flavoring extracts and essences, including extract of lemon, extract of vanilla, essence of peppermint, essence of raspberry, essence of strawberry, etc.
H. W. LAWSON.

Honey. BY T. MACFARLANE *et al. Lab. Inland Revenue Dept., Ottawa, Canada, Bull. No.* 90, 15 pp.—Examinations were made of 99 samples of honey, of which 81 were found to be genuine, 5 doubtful, and the remainder adulterated.
H. W. LAWSON.

Distilled Liquors. BY A. MCGILL. *Lab. Inland Revenue Dept., Ottawa, Canada, Bull. No.* 92, 17 pp.—This gives the detailed data for the examination of 216 samples of distilled liquors. No deleterious substance was found in any instance. Many of the samples were below the standard strength for alcohol required in Great Britain.
H. W. LAWSON.

Cider. BY J. G. A. VALIN. *Lab. Inland Revenue Dept. Ottawa, Canada, Bull. No.* 94, 3 pp.—Analyses were made of 4 samples of commercial cider. The specific gravity varied from 1.0025 to 1.0688. Seventeen samples contained less than 1 per cent. of alcohol by volume. The specific gravity of these samples varied from 1.0368 to 1.0627, showing considerable variation. Fourteen samples contained small quantities of salicylic acid.
H. W. LAWSON.

Ground Spices. By T. Macfarlane *et al.* *Lab. Inland Revenue Dept., Ottawa, Canada, Bull. No.* 95, pp. 25.—Of the 188 samples of ground spices examined, 93 were found adulterated. Analytical data are reported in detail and the methods employed in the examination of ground ginger are described.
H. W. Lawson.

The Nutrition Investigations of the Storrs Experiment Station. By W. O. Atwater. *Conn. Storrs Agr. Expt. Sta. Rep.*, 1903, pp. 99–175.—Following a brief historical account of the nutrition investigations of the station are articles on the following subjects: "The Conservation of Energy in the Living Organism;" "The Demands of the Body for Nourishment and Dietary Standards;" "The Composition of Poultry;" and "Poultry as Food," the last article being by R. D. Milner. The results of 45 metabolism experiments with the respiration calorimeter showed a difference of only 55 calories between the total income and the total outgo of energy, demonstrating, according to the author, that the law of the conservation of energy holds good in the living organism. A large number of dietary studies are summarized and dietary standards are discussed, tentative standards being proposed. Analyses of numerous samples of poultry and poultry products are reported.
H. W. Lawson.

Eighth Report on Food Products. By E. H. Jenkins *et al.* *Conn. State Agr. Expt. Sta. Rep.*, 1903, Part 2, pp. 107–198.—The standards for food products recently established by the secretary of agriculture are given, and the results of the examination of 1,139 samples of food products during 1903 are reported. The methods of analysis used in the examination of cocoa and cocoa products are given in detail. The samples collected by representatives of the station were confined to chocolate, pepper, coffee, and lard, concerning which the detailed data are tabulated. A. L. Winton describes the structural characteristics of a number of seeds of interest in the microscopical examination of feedingstuffs.
H. W. Lawson.

Macaroni Wheat: Its Milling and Chemical Characteristics. By J. H. Shepard. *So. Dak. Agr. Expt. Sta. Bull. No.* 82, 45 pp.—Numerous varieties of macaroni wheat from Russia, Italy, and elsewhere were grown at one or more localities in the State and subjected to milling tests and chemical analysis. The Russian varieties gave the best results and of these the variety Kubanka, stood first. Eleven samples of this variety were examined with the following average results calculated to the air-dry material: *Mill products*—bran 19.17 per cent., shorts 13.04 per cent., flour 67.73 per cent. *Protein content*—whole wheat 13.71 per cent., bran 13.90 per cent., shorts 13.69 per cent., flour 13.53 per cent. *Gluten in flour*—wet gluten 44.66 per cent., dry gluten 15.35 per cent. The general average of the 90 or more samples examined was as follows: *Mill products*—bran 26.91 per cent., shorts 14.5 per cent., flour 58.56 per cent.; *Protein content*—whole whea 14.27 per cent., bran 14.57 per cent., shorts 13.74 per cent., flou 13.94 per cent.: *Gluten in flour*—wet gluten 46.76 per cent., dry gluten 15.96 per cent. The manufacture of macaroni is described and recipes are given for its use. H. W. LAWSON.

The Nature of the Principal Phosphorus Compound in Whea Bran. BY A. J. PATTEN AND E. B. HART. *N. Y. Agr. Expt Sta. Bull. No.* **250**, pp. 167–176.—In preliminary investigation on the metabolism of phosphorus and sulphur in the anima body, reported in Bulletin No. 238 of this station, it was found that from 50 to 86.5 per cent. of the total phosphorus in oats malt sprouts, and wheat bran was soluble in water, and from 2 to 77.8 per cent. in dilute hydrochloric acid. The results of the present work as summarized by the authors show that practically all of the soluble phosphorus of wheat bran is of an organic nature. The organic compound exists in the bran itself as a magnesium-calcium-potassium salt of a phospho-organic acid. The free acid corresponds to the formula $C_2H_8P_2O_9$, and is probably identical with Posternak's anhydro-oxymethylene diphosphoric acid. The alkali salts of this acid are freely soluble in water. The calcium and copper salts are slightly soluble, while the barium and strontium salts are but sparingly so. The acid and its salts seem to be of wide distribution in the vegetable kingdom, having already been isolated from the seeds of red fir, peas, beans, pumpkin, red and yellow lupine, also from the potato and other tubers and bulbs. H. W. LAWSON.

Chemical Changes in the Souring of Milk and Their Relations to Cottage Cheese. BY L. L. VAN SLYKE AND E. B. HART. *N. Y. State Agr. Expt. Sta. Bull. No.* **245**, 36 pp.—In studying the changes which take place in the ordinary souring of milk it was found that the milk-sugar decreased rapidly for thirty-two hours at room temperatures, after which the change was small, ceasing entirely at the end of ninety-six hours. Only about 28 per cent. of the milk sugar originally present disappeared, and of this only about 62 per cent. was converted into lactic acid, the maximum amount found being about 0.9 per cent. It is therefore believed that while the equation $C_{12}H_{22}O_{11} + H_2O = 4C_3H_6O_3$ expresses the most prominent chemical action that occurs, it certainly fails to give anything like a complete and accurate statement of the entire chemical action. At the time of coagulation, which occurred in twenty-four to thirty hours, the acid content of the milk was 0.6 to 0.7 per cent. Previous to coagulation the milk contained as much as 65 per cent. of casein in the form of monolactate, but after coagulation was visible the amount was only 13 to 14 per cent., and later the casein was practically all in the form of dilactate.

These results are discussed in relation to the manufacture of cottage or Dutch cheese, and further studies to determine the relative amounts of casein monolactate and casein dilactate in cottage cheese, the conditions most favorable for the production of such cheese, the manufacture of cottage cheese by the direct addition to milk of artificial acids, the proteolytic changes occurring in cottage cheese, and the relative digestibility of cottage cheese and cheddar cheese in pepsin solutions are reported. The moisture content of cottage cheese varied from 70 to 80 per cent.; the milk-sugar from 3.28 to 4.08 per cent.; and the nitrogen, mainly in the form of casein dilactate, from 2 to 2.5 per cent. Satisfactory results were obtained in the manufacture of cottage cheese by the direct addition of lactic acid or hydrochloric acid to the milk. The conversion of insoluble into soluble nitrogenous compounds in cottage cheese was insignificant. The results of the artificial digestion experiments indicated that cottage cheese is more readily digested than cheddar cheese. H. W. LAWSON.

Comparative Results of Seedling Sugar-canes, D. 74 and D. 95, with Our Home Sugar-canes (Louisiana Striped and Louisiana Purple). BY W. C. STUBBS AND R. E. BLOUIN. *La. Agr. Expt. Sta. Bull. No.* **78,** Series 2, 46 pp.—The results of extended tests of these sugar-canes, including field trials for a series of years, sugar-house tests and a large amount of analytical work, are summarized briefly as follows: "D. 74 is more vigorous, a more rapid grower, gives a larger tonnage, is an erect cane and is believed from this to be more economical in harvesting, stubbles well if not better than home canes, gives a larger extraction, and has a larger sugar content, yielding more sugar per ton and giving a greater tonnage per acre than home canes. The same remarks in a lesser degree apply to D. 95." H. W. LAWSON.

Canaigre. BY R. F. HARE. *N. M. Agr. Expt. Sta. Bull. No.* **49,** 15 pp.—This discusses the sources of tannin, describes cañaigre and its propagation and cultivation, and summarizes the results of determinations of the tannin content of this plant. The air-dried roots contain usually from 25 to 30 per cent. of tannin, but may contain as small a quantity as 15 per cent. or as much as 42 per cent. H. W. LAWSON.

The Preservation of Hen Manure. BY C. D. WOODS AND J. M. BARTLETT. *Me. Agr. Expt. Sta. Bull. No.* **98,** pp. 199–204.—American analyses of hen manure are compiled and experiments in storing the manure to prevent loss of nitrogen are reported. The mixing of acid phosphate and kainit, combined with sawdust and hen manure, is recommended for preventing the loss of nitrogen and making a well-balanced fertilizer. The following proportion is suggested. Hen manure 30 pounds, sawdust 10 pounds, acid phosphate 16 pounds, and kainit 8 pounds. H. W. LAWSON.

The Work of the Bureau of Soils. *U. S. Dept. of Agr., Bureau of Soils, Circ. No.* **13**, 13 pp.—This is a condensed account of the work of the bureau, prepared for distribution at the Louisiana Purchase Exposition. H. W. LAWSON.

The Bacteriological Analysis of Soils. BY F. D. CHESTER. *Del. Agr. Expt. Sta. Bull. No.* **65**, 1904, pp. 49–76.—The functions of soil bacteria and conditions affecting their development are discussed and methods employed by the author in the bacteriological examination of soils are given, along with some of the results obtained. The relative nitrifying power of different soils is shown to be dependent upon both the number and kinds of bacteria present. Numbers may be multiplied by increasing the supply of humus and by thorough tillage, and the development of practical means of introducing favorable species is believed to be a possibility. H. W. LAWSON.

Concerning Soils, Germs and Worms. BY P. FRAZER. *J. Franklin Inst.*, **157**, 255–271.—A general discussion, mainly on the nature of soils and the changes produced in them by the lower forms of plant and animal life. H. W. LAWSON.

A Method of Destroying or Preventing the Growth of Algæ and Certain Pathogenic Bacteria in Water Supplies. BY G. T. MOORE AND K. F. KELLERMAN. *U. S. Dept. Agr., Bur. Plant Ind. Bull. No.* **64**, 44 pp.—The results of the experiments reported in this bulletin are believed to demonstrate that copper sulphate in a dilution so great as to be absolutely harmless to man and animals is capable of destroying or preventing the growth of algæ in water supplies. In laboratory experiments one part of copper sulphate in 1,000,000 to 5,000,000 parts of water was effective in destroying the considerable number of species of algæ tested. It is proposed to introduce the copper sulphate into a water supply by placing the material in a coarse bag and attaching this to the stern of a boat which is rowed slowly back and forth over the reservoir. Several practical applications were made of the method, the results in all cases being considered as favorable. The detailed account is reserved until further tests have been made. Laboratory experiments were conducted with pathogenic bacteria. Typhoid bacilli and cholera germs were destroyed in three to four hours at room temperatures by 1 part of copper sulphate to 100,000 parts of water. The so-called colloidal solution of copper produced by the action of water on metallic copper was also tested. Certain algæ were destroyed by suspending in the water copper foil sufficient to give an area of about 1 sq. cm. to each 100 cc. of water. Pathogenic bacteria were also destroyed in this way. It is believed that water infected with cholera and typhoid germs becomes safe to drink after standing from six to eight hours at room temperature in a clean copper vessel. In the use of copper sulphate in purifying water supplies it is considered absolutely necessary at the outset to obtain definite knowledge as to the organisms present, the character and temperature of the water, and other important facts. "No rule for determining the amount of copper sulphate to be added can be given. Each body of water must be treated in the light of its special conditions." The department earnestly desires to be consulted in regard to any proposed tests of this method. As regards the destruction of pathogenic bacteria, the use of copper sulphate is suggested as a supplement to methods now in use, such as filtration, and not as a substitute for these methods.

H. W. LAWSON.

Analysis of Formaldehyde Sold in North Dakota. BY E. F. LADD. *N. Dak. Agr. Expt. Sta. Bull. No.* **60**, pp. 386–395.—Analyses of a number of samples of commercial formalin showed that the formaldehyde content was frequently below 40 per cent., and was in the majority of cases about 33 per cent. Twenty-one samples reported as purchased from one chemical company showed a range in formaldehyde content of from 21.6 to 38.47 per cent.

H. W. LAWSON.

Spraying for Wild Mustard. BY J. L. STONE. *N. Y. Cornell Agr. Expt. Sta. Bull. No.* **216**, pp. 107–110.—The results of experiments at the station have shown that wild mustard growing with cereals or peas can be destroyed by spraying with a solution of copper sulphate without injury to the crop. A 3 per cent. solution applied at the rate of 40 to 50 gallons per acre has been found to give satisfactory results. H. W. LAWSON.

PATENTS.

DECEMBER 1, 1903.

745,333. Wm. P. Dunbar, Hamburg, Germany. Assignor to Ichthyol Gesellschaft, Cordes Hermanni & Co., same place. **Hay fever serum.** A serum of the blood of animals treated with a saline extract of the pollen of Gramineae, and adapted to immunize test-animals against hay fever, and to remove the symptoms thereof from human beings.

745,378. Heinrich Pawek, Vienna, Austria-Hungary. **Electrolytic refining zinc.** The electrolyte contains salts of zinc, boron and sodium, current 1 to 3 amperes per square decimeter.

745,470. George Wilton, London, England. **Ammonia still.** A tray adapted to form a part of a column still with flanged edges, and a hooded slot extending across the tray in place of the usual circular openings. Opposite the ends of these slots are mud holes in the sides of the tray and also half way between said ends, making four openings in the side of each tray.

745,476. Joshua A. Bell and Lynn T. Leet, Montreal, Canada. Assignors to Composite Stone and Brick Co., Delaware. **Artificial stone.** Sand 94, slaked lime 5, and sodium chloride 1 per cent. are mixed with water to form a slightly coherent mass, then molded, steamed, and immersed in water.

745,490. Thomas J. Grier, Lead, S. D. Extracting **precious metals.** The slimes are settled and the acid neutralized, then the thicker portions are drawn into a vat with a false bottom under which the cyanide solution is introduced and the water displaced and removed from the top, air is then forced through under pressure, and finally a salt solution of greater density than the cyanide solution is used to displace the latter.

745,519. Eugene Pravicha, and Edouard Douillet, La Garenne-Colombes, France. **Separating oil from water.** A tank divided into two or more compartments, with an oscillatory overflow in the first to deliver oil from the surface, the water being drawn off at the bottom of each tank.

745,546. Edwin W. Wheelwright, Birmingham, England. **Compound of phosphorus and sulphur.** Five to fifty parts of sulphur are added to melted phosphorus at a temperature above 165° C., and the heat increased till the mass solidifies, then cooled and the subsulphide of phosphorus (probably P_4S_5) dissolved out by CS_2 or PCl_3 and recovered by evaporation.

745,635. Charles W. Lummis, Cleveland, Ohio. Making **gas.** Powdered coal is introduced into a highly heated chamber with just enough air and steam to make carbon monoxide. Successive portions of air and steam may be used.

745,637. Florentine J. Machalske, Brooklyn, N. Y. **Carbon chlorides and silicon.** Carbon disulphide and silicon chloride are caused to react, forming carbon chloride and silicon sulphide and the latter is reduced to silicon by heating it with carbon.

745,675. Leonard Roth, Kanth, Germany. Assignor one-half to Wilhelm Robert Gentzen, Guhlichen, Rinnersdorf, Germany. **Glucose.** The process of exposing cellulosic material in a closed vessel with exclusion of air to ozonized oxygen under pressure, then adding sulphuric acid and continuing the pressure.

745,802. Lazar Edeleanu and Gregore A. Filiti, Bukharest, Roumania. **Nitro product** from petroleum, sp. gr. 0.890. A solid red-brown substance having elastic properties, soluble in alcohol, acetone and most organic solvents, forming explosives when mixed with oxidizing media, dissolving in potash-lye to a black-brown solution, forming celluloid substances when mixed with guncotton and adapted to form varnishes. Made by adding 3 parts of a mixture of sulphuric acid 5, to nitric acid 1, to one part of petroleum below 80° C.

745,828. Ernest B. Hack, Denver, Colo. Assignor to American Filter Press Extraction Co., same place. **Extracting metals.** The ore is first pulped, then formed into cakes in a filter-press, and these cakes leached by a cyanide solution under compressed air introduced with the solution and continued during the leaching. The cakes may be dried and washed by air pressure.

745,843. Carl H. von Hoessle, Radebeul, near Dresden, Germany. Assignor to Chemischen Fabrik von Hayden, Actiengesellschaft, same place. **Silver chromate.** A colloidal chromate of silver, a dark powder of neutral reaction, insoluble in alcohol and ether, forming a dark-colored fluorescent solution in water of Ag_2CrO_4.

745,870. Leon P. Lowe, San Francisco, Cal. **Separator** and **filter.** A series of settling tanks for the coarser particles of the liquid to be cleared, connecting with a filter for the fine particles.

745,949. Morris C. Wright, Sultan, Wash. **Gold separator.** A flume arranged in the shape of a cross, and inclined slatted bottom in the upper part of said flume, a steeply inclined bottom from the lower end, of the slatted portion, a chamber below having an inclined solid bottom, a second flume at right angles to the first provided with an oblique partition adapted to deflect the gold-bearing sand to the lower part of the second flume which is provided with collecting boxes.

745,950. John H. and Joseph E. Yelvington, Nocatee, Fla. **Insecticide.** Caustic potash 40, sulphur 30, whale oil soap 20, common salt 8, nitric and muriatic acids each 2 pounds, and water enough for complete solution.

745,958. Thomas Ewan, Glasgow, Scotland. Making **sodium.** An electrolyte of fused sodium hydroxide is used and the metal produced at the cathode is separated from the water and anodic oxygen by a porous diaphragm of alumina, the water being evaporated by a current of air.

745,960. Israel F. Good, Allentown, Pa. Assignor one-half to John H. Harris, same place, and George Francis Pettinos of Bethlehem, Pa. Apparatus for **purifying graphite.** A rotary receiving table and a fan over the table for holding the fine graphite thereon while the coarser particles escape. The table is surrounded by an annular tank, with an agitator or scraper, the table being dished upwards and the fan and table turning in opposite directions.

745,966. Florentine J. Machalske, Chicago, Ill. Assignor one-half to Charles Herbert Lyon, same place. **Silicon chlorides.** Hydrochloric acid and alkali hydroxides. A mixture of sand and salt 1 to 4 is heated in an electric furnace till silicon chloride is made, it is then brought in contact with water to make hydrochloric acid and silica, the residual silica being used to mix with salt for a new charge. The furnace residue is treated with water to make sodium hydroxide.

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746,016. Joseph H. Campbell, New York, N. Y. **Milk product.** A portion of the water is evaporated from milk at a temperature below the coagulating point of albumin, then sterilizing, adding bacteria to produce a desired flavor, and ripening the mass, thereby producing a cheese-like mass.

746,039. James C. Davis, Chicago, Ill. Assignor to Sargent & Co., Chicago. **Carbon steel castings.** One to two per cent. of manganese is mixed with the steel while it is poured into a mold, thereby toughening the steel.

746,104. John G. A. King, Phoenix, Ariz. Assignor one-half to Frank H. Stanwood, Lowell, Mass. **Assayers' pulverizing apparatus.** A bucking board to hold the ore, a muller resting by gravity on the board, a motor, a crank shaft in the same horizontal plane as the board, and a pitman freely joined to the crank and rigidly joined to the muller.

746,118. August Lohman, Dallas, Texas. Assignor one-half to H. Freeman, same place. **Artificial fuel.** Lignite 89, a hydrocarbon 8, graphite and kaolin 1 each, asphaltum and paraffin ½ per cent. each.

746,177. Jaques O. Schweitzer, Paris, France. Making **sugar.** The warm massecuite, immediately on its leaving the boiler, is kneaded with alcohol, the mixture cooled and taken to a centrifugal.

746,236. Ralph Baggaley, Pittsburg, Pa. **Separating injurious fumes** containing silver, etc., from smelter gases. A series of moist screens on rollers are placed in the flues in the path of the gases and in a perforated column in which the rollers are set, the perforations inclining upwards, and the rollers feeding the screens forward as fast as they are clogged.

746,239. Ralph Baggaley, Pittsburg, Pa. **Slag-heated boiler.** Melted slag is delivered under a boiler for raising steam and issues from the furnace as a solidified column which is brought in contact with water to still further utilize its heat.

746,241. Ralph Baggaley, Pittsburg, Pa. **Converting matte.** A solid flux of silica is introduced into the converter, heated with auxiliary heat, and the matte poured on the flux.

746,249. **As above.** A large volume of air is introduced into molten copper matte, causing intense heat, a portion of which is removed by a cooling medium at the beginning of the blow while oxidation is rapid, and a flame is applied at the end of the blow when the oxidation fails.

746,251. As above for **arresting arsenic fumes.** Smelter gases containing arsenic are passed through a charcoal filter containing calcium sulphide in solution.

746,254. As above. Apparatus for **cleaning furnace gases.** A set of rods with spring-back faces and cranks, adapted to hold filtering material of vegetable matter for gases between them, and adapted to move said material in the path of the gases to remove sulphur.

746,255 to 746,261 inclusive are all to Ralph Baggaley as above for various modifications of the above apparatus and process in connection with **copper smelters** and silicious ores. He also has the intermediate numbers for car-loading apparatus.

746,281. Charles V. Burton, Fulham, England. Making **steel.** One-half assigned to Wm. John Hartley, same place. Acetylene diluted with a less explosive diluent gas is blown through the molten metal, and the waste gases brought in contact with other metal earlier in the process.

746,320. Herman E. Frees, Chicago, Ill. Assignor to Wahl and Henius, same place. **Brewing.** An alkaline earth and water are mixed with ground corn and the mixture cooked, whereby the soluble oil is saponified to an insoluble soap, the cereal is then mashed, the wort drawn off and the soap caught in the grains that serve as a filter when the wort is separated.

746,366. Otto Neugebauer, Hanover, Germany. **Briquettes.** Coal dust is saturated with loam or clay water, sawdust or turf dust added, and when the mixture is nearly dry, water-glass is added sufficient to allow of molding under pressure.

746,369. Ambrose A. Osborn, San Francisco, Cal. Assignor to California Cereal Co., same place. **Starch-making.** Flour and water are mixed to a dough which is squeezed, rotated in a rotary barrel and at the same time sprayed with water to separate the starch milk, from which the starch is settled, cooled, and dried by cold air.

746,405. Karl Thun, Elberfeld, Germany. Assignor to Elberfeld Co., N. Y. **Purpurin-α-sulphonic acid.** The sodium salt is soluble in water yellow-red, in ammonia, caustic soda and sodium carbonate solution red, in 66° sulphuric acid yellow-red turning violet with boric acid, and dyeing alumina mordanted wool red, and chrome mordanted wool blue-red shades.

746,452. Charles F. Brush, Cleveland, Ohio. **Water gas.** Bituminous coal at a high temperature is treated with steam and oxygen and the resulting gas subjected to a second treatment with the same substances.

746,502. Wm. A. Hall, Bellows Falls, Vt. **Synthetic milk powder.** Eighty-five parts of dry casein are dissolved in a solution of 10 parts of alkali in water, dried and the mixture ground, 2 parts finely powdered calcium chloride added and to each 4½ parts of casein 5 parts of milk-sugar, the whole being thoroughly mixed. Five parts of butter-fat may be added. To form the synthetic milk, 5 parts of the powder are added to 95 parts of water.

746,553. George H. Moore, Norwich, Conn. **Composition cork.** Ground cork 3, mineral fiber 1, starch 15, soap and water 1 to 8 parts sufficient to form a dough. Used for bottle stoppers, insoles, etc.

746,594. Leonard Smith, London, England. **Isochromatic photographic plate.** The film is made of successively superimposed layers of color sensitive emulsion of varying degrees of sensitiveness, having incorporated the potassium salt of tetraiodide of fluorescein in different proportions, the lower coat having the least and the upper coats increasing amounts thereof.

746,638. Oscar Liebreich, Berlin, Germany. **Fatty substance.** An acidulated derivative of an aromatic base is mixed with a fatty acid having more than 10 atoms of carbon. Example, vaselin and stearic anilid.

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746,663. Arthur C. Bourdeau, Battle Creek, Mich. Assignor to Battle Creek Pure Food Co. **Malted flakes.** Cereal grains are soaked in cold water till fully swollen, drained and steam-cooked at 235° F., cooled and partially dried, aërated and cooled to prevent fermentation, then warmed and mixed with diastase, and the grains flaked by pressure and finally roasted.

746,668. Francis J. Bulask, Toledo, Ohio. **Artificial fuel.** A thin dough is made of flour, a solution of caustic alkali and plaster of Paris, the mixture soaked in a saturated solution of alum, dried, baked and ground, and used in solution as a binder for combustible material and sodium chloride.

746,678. George C. Cowles, Bay Mills, Mich. Assignor to Robert H. Munson, same place. **Preserving lumber.** Undressed lumber is dipped in a weak solution of sodium bicarbonate that penetrates only the depth of a shaving, so that the skin is planed off by dressing the board.

746,688. Daniel H. Dupont-Franklin, New York, N. Y. **India rubber substitute.** Coal tar 100, boracic acid 25, and oxygen blown through the mixture.

746,689. As above for **process of mixing** the coal tar and boracic acid dissolved in alcohol, boiling it and passing oxygen through the compound.

746,703. Fritz Hoffmann, Elberfeld, Germany. Assignor to Elberfeld Co., New York, N. Y. **Geraniol derivative.** A limpid oil boiling at 112° to 113° C. under 12 mm. pressure, splitting off water on heating with acids, dimethyl-2-6-nonatriene-2-6-8 being produced, derived from citral, halogen alphyls, ether, and magnesium.

746,721. John W. McDonald, Pittsburg, Pa. **Extracting metal.** A solid body of silicious flux is held over a body of molten ore, the lower end resting on the furnace hearth, and is fed downwards as it is melted from the lower end.

746,734-5-6. Leon Naudet, Paris, France. Process and apparatus for **extracting sugar.** The first two cover mashing cold material by exposing the raw juice to hot juice till heated to 77° C., and coupling the cell having the hot mashed material so as to be the last cell of the series. The juice is then treated to alkali and carbon dioxide in quantity varied to maintain a certain fixed standard of the outflow. The last patent is for an arrangement of the diffusion cells and supply tanks with connecting pipes adapted to carry out the above processes.

746,760. Annie Studd, Chicago, Ill. **Furniture polish.** Beeswax is boiled and mixed with turpentine 1 to 5 parts, then cooled and boiled again slowly a short time.

746,773. Robert H. Aiken, Winthrop Harbor, Ill. **Smelting copper ores.** A mixture of sulphide ores, silica and flux is put in the furnace, a blast of air turned on the upper zone of heat to oxidize the iron sulphides, and a blast of mixed air and vapor fuel let on the lower zone to maintain therein a melting temperature so as to form a matte of the copper sulphides and a slag of the iron oxides and silica.

746,784. Rene Bohn, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. **Dyeing blue.** Indanthrene is treated with sodium hydrosulphite as in an indigo vat, the dyed fiber turning green or yellow on treatment with chlorine, nitric or chromic acid, turning blue by adding a hydrosulphite.

746,795. Paul Danckwardt, Deadwood, S. D. Making **alkali cyanides.** A nitride and carbide of an alkali earth metal are mixed with an alkali salt and heated in an atmosphere of nitrogen with addition of fresh material.

746,796. As above for simultaneously producing **alkali cyanide** and **alkali metal.** An alkali nitride is heated in the presence of carbon and an alkali metal both in *statu nascendi*, and with exclusion of air.

746,797. As above for **separating metals** from Matte. Mixtures of iron or other sulphides, arsenides, and valuable metals are electrically heated with exclusion of air and with so much metallic carbide as will reduce the sulphides and arsenides of the valuable metals to a metallic state without reducing the iron sulphide.

746,798. As above for **recovering zinc** from zinc sulphide. The above process is carried out with sufficient carbide to form carbon monoxide of all the oxygen, and flux enough to slag all impurities, the mixture is electrically heated under a heavy cover of carbon, the zinc vapors are condensed and the heavy metals settled from the slag of sulphides, the latter are leached and the solution acted on by carbon dioxide, the hydrogen sulphide being decomposed for recovery of its sulphur, and the alkali carbonate crystallized out.

746,802. Carlton Ellis and Owen J. Flanigan, Boston, Mass. **Aluminum-soldering flux.** Silver chloride and vaseline or resin cast in sticks.

746,814. James Gayley, Braddock, Pa. **Drying air** for blast-furnaces. The air is cooled to 0° C. in a chamber to condense the moisture, and is then fed into the furnaces under constant pressure.

746,867. Dewitt C. Mosher, Colorado City, Col. Assignor to Charles M. McNeill, Colorado Springs, Colo. **Chlorination barrel.** A lead-lined rotating barrel has a hollow central axis with numerous hollow arms all perforated with small holes.

746,876. James H. Paul, Charlton, England. **Hydrocyanic acid** and salts thereof. Calcium ferrocyanide is heated with sulphuric acid, and the resulting hydrocyanic acid led into caustic alkali to form cyanides.

746,891. Claus A. Spreckels and Charles A. Kern, New York, N. Y. Assignors to Federal Sugar Refining Co., Jersey City, N. J. **Refining sugar.** A sulphonated fatty body is mixed with a hydrocarbon oil and the mixture added to the sugar juice in a quantity equal to the impurities present.

746,909. Adolf Zand, Charlottenburg, Germany. **Iridescent scales.** Mother-of-pearl waste is boiled in dilute hydrochloric acid and then heated to a temperature that will not destroy the organic matter of the material, which is then crushed.

746,926. Edward Culmann, Buffalo, N. Y. Assignor to Schoelkopf Hartford and Hanna Co., same place. Orange to yellow-brown **sulphur dye.** Dark brown powders soluble in water, the addition of acid giving a brown precipitate which is soluble in strong sulphuric acid yellow to brown. Obtained from the sulpho acids of toluylene diamine such as 1, 2, 4, 5 or 1, 2, 6, 4.

746,933. Chester B. Duryea, Sioux City, Iowa. **Maltose.** A very dilute acid is added to a thin boiling starch, the mixture cooked, neutralized, malt added and the maltose separated.

746,954. Wm. D. Gilman, Roland Park, Md. **Barium sulphate and zinc chloride.** Barium sulphide and zinc chloride in solution are mixed, the resulting barium chloride separated and added to zinc sulphate and the barium sulphate and zinc chloride isolated.

746,981. Carl L. Muller, Ludwigshafen-on-Rhine, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. Yellow **acridine dye.** Aminoacridine-yellow is heated with glycerin, making a dye that dissolves in concentrated sulphuric acid, the solution turning green on heating to 100° C.

747,003. George Shambeck, Salt Lake City, Utah. **Polishing compound.** Raw linseed oil 7, grain alcohol 1, turpentine, hydrochloric acid, and water 10 parts each.

747,081. Alfredo Neuwalaers, Jalapa, Mexico. Treating **tobacco.** The leaves are first subjected to the action of anhydrous sulphurous acid gas and then to a combined bath of vapor and air, the vapor being obtained by heating a mixture of tobacco extract, glycerin, alcohol and *origanum* or other aromatic plant.

747,138. Joseph Choulet, Algiers, Algeria. **Disinfectant.** Calcium carbide is added to a solution of copper sulphate in a closed vessel with a suitable jet, and the resulting mixture of acetylene and copper pulp is atomized by the pressure of the gas for spraying plants.

747,184. Robert W. Johnson, New Brunswick, N. J. **Formaldehyde fumigator.** Paraform 2, naphthalene and pyrethrum insect powder 1 part each, are molded into a form, coated with paper, impregnated with a nitrate, and the whole enclosed in a suitable jacket.

747,193. Lynn T. Leet and Claude A. O. Roselle, New York, N. Y. Assignors to Composite Stone and Brick Co., of Delaware. **Indurating stone.** The ingredients of artificial stone are mixed and molded, then steamed and soaked in milk of lime at high temperature and pressure.

747,228-30. Both to Claude A. O. Roselle for **composite stone.** Assigned to Composite Stone and Brick Co., Delaware. Lime, and a solution of caustic soda, are mixed with sand, molded and saturated with milk of lime containing caustic soda, and the hardening completed. The second substitutes silica and a soluble aluminate as sodium aluminate for the milk of lime.

747,234. Marcus Ruthenburg, Harrisburg, Pa. **Bleaching paper pulp.** An aqueous solution of sodium chloride and calcium hydroxide is mixed with the pulp, which is put between opposed plates arranged in series, and energized by an electric current of 3 volts, 0.5 ampere per square inch.

747,256. Claus A. Spreckels and Charles A. Kern, New York, N. Y. Assignors to Federal Sugar Refining Co., Jersey City, N. J. **Cleaning sugar crystals.** The crystals are saturated first with a sulphonated oil and then with a saturated solution of sugar, both solutions being successively removed.

747,267. Magnus Swenson, Madison, Wis. **Eliminating solvents** from seeds. A heated solvent vapor as gasoline vapor is passed through the seed till all the solvent is vaporized and the seed dried, then exhausting the solvent by a vacuum and passing a current of heated air through the seed.

747,271. Joseph Tscherniac, Freiberg in Breisgau, Germany. **Hydrocyanic acid and cyanides.** A heated mixture of a sulphocyanide and nitric acid is treated with oxygen (an air blast), and the evolved gases are passed over sodium carbonate heated to 450° C., forming sodium cyanide of 98 per cent.

747,291. David M. Balch, Coronado, Cal. Assignor one-half to Anson P. Stephens, same place. Extracting **potassium chloride** from algae. The dried sea-weed is cut up and dusted with lime, then carbonized in air-tight receptacles, the carbon ground, lixiviated and evaporated, thereby obtaining merchantable potassium chloride.

747,295. Edmund Bourcart, Mulhausen, Germany. Assignor to Firma Produits Chimiques de Thann et de Mulhause. A precipitated sulphur dye is mixed with a thickener, an alkaline bicarbonate and a reducing agent to form a **printing paste** without reduced dye, then printing and steaming to form the sulphide necessary to reduce and fix the dye.

747,301. Neander N. Chronholm, Chicago, Ill. **Artificial butter.** Whipped eggs, 4, are thoroughly mixed with melted oleo 5, neutral lard 7, common salt and butter 1 part each.

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747,347-8. Otto P. Amend, New York, N. Y. Assignor one-half to Josiah H. Macey, Boonton, N. J. **Desulphurizing oils.** In the first, oil is treated with copper hydroxide in a neutral saline solution, the excess of copper is removed and the oil subjected to an acid, the acid sludge removed and the oil washed with water. The second process blows steam and air through the oil, agitates with an alkali and continues the treatment according to the first process.

747,372. Wm. F. Brown, Goldthwaite, Texas. **Egg-preserving coating.** A solution is made of Coopers, Cox's and white gelatin and 2.6 per cent. of water-glass incorporated with it.

747,483. James Rice, Detroit, Mich. **Disintegrating emery wheels.** The broken wheels are put in an alkaline solution and heated till disintegration takes place, then the material is washed, dried and graded.

747,520. Moritz Weinrich, Yonkers, N. Y. Treating **sugar-cane.** Finely shredded cane is soaked in a lime solution heated nearly to the boiling-point, with lime enough added to fully neutralize its acidity, and then delivering the mass to a cane mill.

747,600. Daniel D. Franklin, New York, N. Y. Fixing compound liquids. (**Preserving milk.**) Milk is forced through minute openings against an impact surface under a pressure of about 200 atmospheres the openings being $^1/_{10}$ of a millimeter in diameter.

747,629. Wilhelm Naschold, Uerdingen, Germany. Assignor one-half to Uerdingen Chemische Fabrik, Uerdingen, Lienau & Co., same place. Purifying **pinene hydrochloride.** Pinene hydrochloride is treated successively with sodium carbonate and sulphuric acid in such quantities as to remove the easily saponified by-products and those capable of resinification, and the purified pinene hydrochloride is then sublimed under reduced pressure.

747,643. Niklaus Rongger, Basle, Switzerland. Assignor to corporation, formerly Sandoz of Basle. **Blue sulphur dye.** *p*-Oxy-*p*-amino-*m*-methyl diphenylamine is heated with sulphur and chromium hydroxide to 170° to 210° C. A dark blue powder, insoluble in water and alcohol, soluble in strong, cold sulphuric acid blue, and in cold, dilute alkaline sulphides blue, turning to brown on boiling, but dyeing unmordanted cotton blue.

747,661-2. Benjamin Talbot, Harrowgate, England. Assignor to Continuous Metal Refining Co., Philadelphia, Pa. **Open-hearth steel.** First charging a furnace with melted iron, lime, carbon and a metallic oxide, adding melted iron or steel containing phosphorus, removing the slag and repeating the treatment, withdrawing the steel as it is reduced. The second covers the bath with a calcareous slag, adds melted iron rich in silica, burning the carbon oxide evolved, and heating the charge to a tapping condition.

747,678. Xavier Binder, Paris, France. **Milk extract.** Sulphuric acid is added to milk and the whole heated to peptonize the albumin, the acid is precipitated by calcium carbonate, the sugar of milk crystallized out and hydrogen peroxide added as a preservative, the peptonized milk is boiled and a little monopotassium phosphate added.

747,689. John J. Feely, White Plains, N. Y. Assignor one-half to James O. Connel, New York, N. Y. Treating **lime.** Lime is slaked with dilute acetic acid 1–250, dried and ground, when it is ready for use in mortar.

747,740. Daniel Malone, Baltimore, Md. **Drying barrels** for spirits. The interior of wooden barrels is treated with dry heat at 250° F. for one hour whereby the tannic acid is brought to the surface.

747,882. Carl von Forell, Hamburg, Germany. **Cement.** Highly heated furnace slag is disintegrated by steam jets and projected through a cooling fluid on a moving surface to form a highly cementitious material.

747,898. Thomas M. Stack and Walter R. Peck, New Milford, Conn., the last by Marie Antoinette Peck, executrix. Composition for **removing varnish.** Amyl acetate, alcohol and benzene 4 gallons each, acetone and benzene 62° 3 each, thoroughly mixed.

747,919-20-21. Hermann Passow, Hamburg, Germany. Assignor to Henry Edmonds, London, England. **Cement.** Water granulated furnace slag is heated to 1,200° C., and quickly cooled, giving when treated with carbon dioxide a rise of temperature; this active material is mixed with granulated dried slag to make a cement. The second is for disintegrating molten slag into particles caused to impinge on a surface and thereby to cohere, and the third for melting slag in a Bessemer converter and blowing oxygen through it.

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747,935. Edward M. Caffall, Sparkill, N. Y. **Water-proofing and preserving.** The surface is heated with hot, compressed air and, while hot, sprayed with hot paraffin or asphaltum, then the application of the hot compressed air is repeated. Applied to brick walls or metal articles.

747,944. Nathan W. Condict, Jersey City, N. J. **Ammonia still.** In refrigerating apparatus the horizontal cylinder has horizontal superposed layers of steam coils having inlet and outlet pipes at the same end, but towards different sides of the cylinder, and provided with stuffing boxes, the pipes of the separate layers passing out of the opposite ends of the cylinder alternately.

747,961. Paul G. Frauenfelder, New York, N. Y., by Lena R. E. Frauenfelder, executrix. **Color photography.** A series of rays from the object are segregated into bundles by narrow slits which are further dispersed into the spectral colors by prismatic surfaces and which are caused to fall on the sensitive surface in the same order in which they left the object and then developing the image whereby the latter is formed by the dispersed rays of colored light proceeding from all parts of the object to be photographed.

748,019. Carl Rubitschung, Frankfort-on-Main, Germany. **Artificial asphalt.** Tar and broken stone are separately heated and mixed, then powerfully cooled by falling through air, forming a dry, transportable, granular mass, and then adding a binding agent as granulated pitch.

748,076. Adolf Israel and Richard Kothe, Elberfeld, Germany. Assignors to Elberfeld Co., New York, N. Y. **Trisazo dye.** The sodium salt of an acid which is a dark powder, soluble in water blue-black, turning green on adding ammonia, soluble in concentrated sulphuric acid 66° Bé. blue, turning reddish black on adding ice, and dyeing unmordanted cotton deep black. The acid is derived from a *p*-diamine and 1-acetylamino-2-4-diamino benzene.

748,099. Bartolomej Pikryl, Chicago, Ill. Composition for **improving storage eggs.** Rectified spirits and glycerin equal parts, salicylic acid 1 per cent., and of the extracts of orange peel and vanilla 15 per cent. each, of saffron and amyl valerianate 2 per cent. each.

748,101. Eduard Ritsert, Frankfort-on-Main, Germany. **Aromatic ester.** Anesthetic white crystals, soluble in cold water and alcohol, but not in ether, obtained from the reaction of aromatic sulphonic acids on aromatic amino carbonic acid ethers.

748,179. Edwin H. Fowler and Dickerson N. Hoover, Washington, D. C. **Paper.** Impregnates it with a mixture of glycerin 1.5, alcohol 2, and water 1 part by weight to 100 parts of paper. May be printed without damping.

748,200. Hudson Maxim, Brooklyn, N. Y. **Smokeless powder.** Soluble pyroxylin, 3 parts, is gelatinized in ether-alcohol which is not a solvent of trinitrocellulose, and thoroughly mixed with 1 part of trinitrocellulose dissolved in acetone or acetic ether, from which it is precipitated by mixing.

748,217. Charles H. Rider, St. Louis, Mo. **Solution apparatus.** Three series of tanks are arranged in sets of three each, one over the other, with connecting pipes so as to make almost any combination of any one tank with any other, and also to deliver from the bottom or top of one tank to the bottom or top of the next, supply tanks over each end, and a retort and furnace at one end with a condenser at the other. Adapted for making sulphurous acid, nitric acid, etc.

748,235. Alpheus A. Turner, Bristol, Ind. **Veneer coating** for wood or canvas. Sand, Portland cement and glue equal parts, molasses 2 parts by volume.

748,270. Wm. O. Emery, Crawfordsville, Ind. Composition for **protecting iron.** Quicklime, quartz, feldspar, alumina and sodium sulphate are fused to a clear highly viscous mass, cooled, crushed and mixed with hot melted asphalt. The frit is substantially $5(Na_2O.K_2O).7CaO.6SiO_2$.

748,284. Joseph Karwowski, Herkimer, N. Y. **Preserving the dead.** The corpse is coated with sodium silicate, which is dried, and is then enveloped in molten glass.

748,308. Hans Reisert, Cologne, Germany. **Removing sulphuric acid from water.** A rectangular vessel has a filter in the bottom and within it a conical vessel with a filter on top and lower than the upper edge of the outer vessel, the latter receiving a supply of lime-water from a supply tank, the inner conical vessel containing a barium carbonate bath, the water to be purified being fed in the bottom of the cone.

748,313-14. Both to Wm. C. Salisbury, Dakota, Nebr. Assignor to Andrew J. Kramper, same place. **Sugar-making.** The first adds 1 ounce of pulverized alum to 100 gallons of juice, and boils an hour with stirring and skimming, the second adds to the alum a half ounce of sodium bicarbonate and 25 pounds of sugar, stirring and skimming an hour, then cooling and adding maple, vanilla or a similar extract.

748,317. Scott A. Smith, Providence, R. I. **Lubricant.** Air-slaked lime is mixed with antimony trioxide 1–30, the whole powdered, and added to a mixture of 50 parts of heavy gravity petroleum and 1 part of a light oil.

748,319. Albert G. Stevens, Cape May, N. J. **Chemical mixer.** A water-tight box is mounted on a wagon and has a longitudinal partition, and a mixing cylinder in the partition so as to open into each division extending above the top and having an inner revolving cylinder with an agitator and holes through both cylinders which may be adjusted so as to register or not and when in registry to form a communication between the two chambers of the box.

748,341. Paul Bez, Leran, France. **Incrustation preventive.** Barium chloride 240, tannin 40, and mucilage of tanners waste 20 parts by weight.

748,356. Hermann Eggers, West Hoboken, N. J. **Fuel-saving briquette.** Equal parts of sand and clay and sufficient glue or soluble glass are mixed with coal dust and molded under pressure.

748,375. Eduard Hepp, Frankfort-on-Main and Christoph Hartman, Hochst-on-Main, Germany. Assignors to Farbwerke, vorm. Meister, Lucius und Bruning, Hochst-on-Main, Germany. **Blue anthraquinone dye.** Aminooxyanthraquinones are halogenized, then heated with an aromatic amine, and finally sulphonated, forming, when dry, dark blue powders, soluble in water, turning violet on adding sodium carbonate or caustic soda, and precipitated by common salt or dilute mineral acids, soluble in concentrated sulphuric acid blue, turning red by a little water, but much water causing a blue precipitate to separate.

748,457. Hinrik C. Aminoff, Domnarfvet, Sweden. Assignor to Anders Conrad Mark, Gothenburg, Sweden. **Charring and distilling furnace.** A long inclined furnace built on the ground, the substance treated moving from the lower to the upper end of the furnace and a separate passage for the gases generated from the lower end to the upper with an interposed heater, and fan to force the gases into the upper end and out at the lower end, heating the material in their passage.

748,461-2. Wm. J. Armbruster, St. Louis, Mo. **Chlorination barrel.** One-half assigned to Florance Armbruster, New York, N. Y. One end of the barrel is provided with a chlorine generating compartment and suitable pipes connecting the last with the pulp chamber, all rotating together.

748,511. Oscar Liebreich, Berlin, Germany. **Fat-like substance.** Paraffin is united with an acidulated derivative of an aromatic base whose acid radical contains more than 10 carbon atoms.

748,518. Watson A. McLaughlin, Delta, Pa. **Cleaving slate.** Slate blocks are soaked in water for twelve hours then frozen and while frozen are exposed to zero Fahrenheit for about twenty-four hours, and then split.

748,523. Wilhelm Falmaer, Stockholm, Sweden. **Bicalcium phosphate.** Perchlorate of sodium is electrolyzed and the acid solution is made to act on mineral phosphate in a separate vessel and the resulting solution is mixed with the alkaline cathode solution to precipitate bicalcium phosphate.

748,525. Robert S. Perry and Hermann G. Schanche, Philadelphia, Pa. **Drying aluminum sulphate.** The salt is heated to about 227° F. just below its melting-point, and the temperature increased as the melting-point of the salt rises from loss of water.

WILLIAM H. SEAMAN.

REVIEW OF AMERICAN CHEMICAL RESEARCH.

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William A. Noyes, Editor.

INORGANIC CHEMISTRY.

The Action of Magnesium Oxide on a Mixture of Arsenic Trisulphide and Sulphur. By W. W. Foster, Jr. *Ztschr. anorg. Chem.*, 37, 59–68.—McCay has shown that when magnesia is shaken with a mixture of arsenic trisulphide and sulphur ($As_2S_3 : 2S$), a reaction takes place which involves the total amount of trisulphide and sulphur. Foster tried to determine the nature of the compounds formed. His method was as follows: A moist mixture of arsenic trisulphide and sulphur ($As_2S_3 : 2S$) was ground to a paste and treated with an excess of magnesia and water. As soon as a homogeneous mass was obtained, it was put into a flask and shaken at the required temperature. After the reaction was completed, the dissolved magnesium was precipitated with sodium hydroxide and filtered. The sodium salts remaining were precipitated either by addition of 95 per cent. alcohol or by evaporation of the filtrate. They were analyzed for sulphur, arsenic and sodium. Sulphur was determined in the usual manner: From the filtrate from the barium sulphate the arsenic was precipitated by means of hydrogen sulphide at 100°; and the remaining sodium was determined as usual.

Various resultsobtained under varying conditions of temperature and difference in method of precipitating the final product, lead Foster to these conclusions:

(1) That, at ordinary temperature, small amounts of monosulfoxyarsenic acid are formed, and a large amount of a compound richer in sulphur, probably trisulfoxyarsenic acid. Disulfoxyarsenic acid, as well as sulfarsenic acid are formed.

(2) That these four acids exist in equilibrium in the solution, but that the trisulfoxyarsenic acid is unstable and goes over into the others.

H. I. Schlesinger.

Specific Gravities of Lithium Chloride, Bromide and Iodide. BY G. P. BAXTER. *Am. Chem. J.*, May, 1904.—The paper consists chiefly of a discussion of the methods of obtaining the pure salts. They were all made by the action of the respective halogen acids on lithium carbonate. This was obtained pure by first boiling a solution of lithium carbonate in nitric acid with an excess of the carbonate and then precipitating twice with ammonium carbonate.

The acids also were purified. Hydrochloric and hydrobromic acid were purified by a distillation in platinum apparatus. The bromine from which the hydrobromic acid was made had been purified from chlorine in the usual way. Iodine was not purified by sublimation; the process employed consisted of distilling the iodine first from potassium iodide, and then from water. The iodine was, without previously drying, converted into the acid, by means of water and hydrogen sulphide. Sulphuric acid was precipitated with barium hydroxide (crystallized); and finally the acid was redistilled.

The lithium carbonate was then dissolved in an excess of the respective acids, and the excess neutralized with ammonia gas. The ammonium compounds thus formed counteracted any tendency of the lithium halides to become basic, when heated in the moist state; of course these compounds were driven off in the process of drying.

For the determination of the specific gravity of these salts, a pycnometer especially devised for this work was used. This had been previously described by Baxter. The results differ slightly from those of other investigators, but are probably correct. A correction to a previous paper on the specific gravities of cadmium chloride, bromide and silver bromide is appended.

H. I. SCHLESINGER.

The Reduction Temperature of Zinc Oxide. Report of a paper by W. MCA. JOHNSON. *Electrochemical Industry*, May, 1904. The determination of the reaction temperature of zinc oxide and carbon is made difficult by the lag of the pyrometer behind the reaction and the temperature gradient of the charge of the mixture. To overcome this difficulty Mr. Johnson devised a chamber or cell, made from solid Acheson graphite bars. The cell is so constructed that the lower part contains the pyrometer, and that the reaction chamber can be tightly closed, with the exception of a fine hole. The cell is heated, and the emission of the zinc flame from the little hole is a sign that the reaction temperature has been reached.

Mr. Johnson finds that the temperature of roasting affects the ease of reduction and that different reducing materials have different rates of reduction. "The idea of the author is that the reduction of zinc oxide is caused by the very slight vapor of solid carbon and the slight dissociation pressure of zinc oxide tending to break up the zinc oxide into zinc and free oxygen."

H. I. SCHLESINGER.

On the Variation in the Density of Ice. BY H. LESTER COOKE. Sec. III, 1902, *Trans. Roy. Soc.*, Canada.—A very striking disagreement is found in the determinations of the density of ice, as made by different observers. The variations are greater than the probable error, and Cooke attempts to explain these on the ground of an actual variation in the density.

The ice used by all the experimenters was chiefly artificial; and was made in such a way that it fell into one of three classifications: (1) Interior formation, *i. e.*, formed on the inner wall of the vessel; (2) exterior formation, *i. e.*, formed on the outer wall of the vessel; and (3) column formation, formed within a tube as the tube is gradually immersed into the freezing-mixture. Cooke shows that, on *a priori* grounds, one would expect ice of the interior formation to increase in volume when finally brought to a zero bath; that ice of the second formation would tend to decrease in volume; and in the case of the column formation one would normally expect a decrease in the volume of ice, although an increase might occur.

Ice of normal density, the author believes, is formed when ice is precipitated from dust-free, undercooled water. He believes also that ice taken from the lower layers of a covering of ice upon a pond would have a normal density, as well as ice of icicles, when these are formed under conditions, such that they are kept wet.

The author cites some facts which seem to support his view. They are, however, not sufficiently definite to be considered proofs, and Cooke intends to experiment further on the subject.

H. I. SCHLESINGER.

On the Density of Ice. BY N. T. BARNES AND N. L. COOKE. *Trans. Roy. Soc.*, of Canada, Sec. III, 1902.—The authors give a short review of the work of earlier experimenters in this work. They classify the experiments into three groups, those involving:

(1) The method of equilibrium.
(2) The dilatometric method.
(3) The method of double weighing.

The first method permits of no great accuracy, its sole advantage being that either natural or artificial ice may be used. In the second method, such varying apparatus is employed by different experimenters that no general statement can be made—Kopp, Plücker, Geissler and Bunsen used the method. Their results are fairly accurate, but the errors introduced by the formation of the ice within the instrument itself, vitiate the results of all of the experiments. The last method was made use of by Brummer and by Nichols, and seems to lead to the most accurate results. But as both men weighed the ice at temperatures below 0° C. the authors believed a new determination advisable. The ice at 0° C. was weighed first in the air and then in water of this temperature, and its density calculated from the loss of weight. Water could not act upon the ice without access of heat and this was prevented by the experimental arrangements. The method of carrying out the experiments is carefully described. The value found for the density of St. Lawrence River ice is 0.91661 ±0.00007.

One of the primary objects of the experiments was to determine the variation of density of old and new ice. None was noticed in the ice used (ice formed on the lower surface of a thick field of ice completely covering a river).

H. I. SCHLESINGER.

An Experimental Investigation of the Conditions Determining the Oxidation of Ferrous Chloride. BY A. MCGILL. *Trans. Roy. Soc.*, Canada, 1902, Sec. III.—The author was led to an investigation of this problem in order to ascertain the practicability of the fourth stage of Kopp's soda process. This stage involves the oxidation of ferrous chloride (by air or oxygen) to ferric oxide and free chlorine.

The author shows that the best results are obtained when dry ferrous chloride is used, and he believes that the loss of chlorine by heating is fully compensated by the greater yields resulting from the use of the dry salt. He shows also that ferric oxide acts as a catalyzer and thus increases the yield. Both the drying process and the production of chlorine are aided by the presence of the oxide. He shows that red heat is necessary for complete decomposition, and that if all these conditions are observed, ferrous chloride can be decomposed by oxygen to yield 75–85 per cent. of free chlorine and 10–20 per cent. of hydrochloric acid. He advises the use of cheap oxygen instead of air, as the nitrogen of the latter dilutes the chlorine too much.

H. I. SCHLESINGER.

The Behavior of Typical Hydrous Chlorides when Heated in Hydrogen Chloride. BY F. A. GOOCH AND F. M. MCCLENAHAN. *Am. J. Sci.*, May, 1904.—Hydrous metal chlorides may be grouped into three classes, *viz.:*

(1) Those in which hydrolytic decomposition does not begin until after reaching a temperature much greater than that required to drive off the water, *e. g.*, $BaCl_2,2H_2O$;

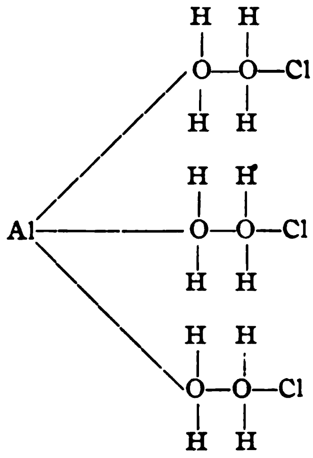
(2) Those in which only a part of the water can be driven off before the beginning of hydrolytic action, *e. g.*, $MgCl_2,6H_2O$; and

(3) Those which lose water only with a simultaneous formation of hydrogen chloride and exchange of chlorine for oxygen at 100°, and, at temperatures at which all water is removed, are completely converted to the oxide, *e. g.*, $AlCl_3 6H_2O$.

It is evident that in the last two cases the rate of decomposition will be affected by the concentrations of the active products of decomposition. An increase in the concentration of hydrogen chloride (which might be produced by heating the hydrous chlorides in hydrogen chloride) would serve to restrain hydrolytic action and make possible a more complete dehydration.

Gooch and McClenahan studied this problem. As was to be expected, they found that $BaCl_2,2H_2O$ acted normally when heated in an atmosphere of hydrogen chloride. In the case of $MgCl_2,6H_2O$ hydrogen chloride appears to have little effect upon the first third of the water (which may be removed at 100°); it acts in restraint of the process of dehydration when the salt is placed at once in an atmosphere heated to a point between 100° and 130°, and it aids dehydration at temperatures above 130°. The dehydration of $AlCl_3,6H_2O$ is inhibited by an atmosphere of hydrogen chloride until a temperature of 130° is reached. Above that point, as in air above 100°, water and hydrogen chloride are evolved simultaneously.

The authors discuss the bearing of their results upon Cushman's hypothesis regarding the structures of such hydrous chlorides as those investigated. The hypothesis involves the assumption of quadrivalent oxygen in a way to show the linkings of stronger and weaker combinations. The authors discuss the formula given to the hydrous aluminum chloride by Cushman:



They show that although from the configuration alone, one would expect an elimination of all the chlorine and formation of the metallic oxide, yet there is nothing to prevent the action of the liberated hydrogen chloride upon the oxide. In this way the retarding effect of an enormous excess of hydrogen chloride is explained. The symbols given for hydrous magnesium chloride explain the peculiar behavior mentioned above. The authors find that the formulae of Cushman give a reasonable expression of the facts observed. H. I. Schlesinger.

Radium in Uranium Compounds. By B. B. Boltwood. *Eng. Min. J.*, May 12, 1904.—The author's experiments lead him to the view that the per cent. of radium in a mineral varies directly as the per cent. of uranium present. The apparatus used to determine the ratio of the radium to the uranium consists of three bulbs, A, B, and C connected to one another. A is about 50 cc. in volume, B is smaller than A, and C the smallest. Into B the finely powdered mineral is introduced, into C a suitable acid. The apparatus is then tilted so that the acid flows upon the mineral and the mixture is allowed to digest until the mineral is completely decomposed. The apparatus is allowed to stand a few days until the emanation which is set free from the radium by the process has completely diffused. The bulb A is then sealed off and the emanation it contains is introduced into an electroscope and the rate of leakage measured. Since the rate of leakage is a measure of the amount of emanation and this of the amount of radium, the ratio between radium and uranium can be determined. The author finds a fairly constant ratio in different minerals. The accuracy with which the amount of radium may be measured by this process is very great. It is possible to compare the relative quantities of radium in two samples of pitchblende, weighing 0.001 gram and 0.002 gram respectively, with a fair degree of accuracy. Since the amount of radium in pitchblende is probably less than 0.001 of a per cent., it is evident that the method is capable of detecting very small quantities of radium.

This result seems to be favorable to J. J. Thompson's hypothesis that radium is a decomposition product of uranium.

H. I. Schlesinger.

Unknown Element. *Ann. Rep. Minister of Mines* [British Columbia], 1902, p. 27.—The Provincial Assayer, Herbert Carmichael, refers to the examination of the solid residue from a spring water in the Kootenay District, and reports having observed in the spectrum produced by volatilizing the chlorides in the Bunsen flame, three lines in the blue, two strong ones of wave-lengths 4327 and 4404, and a rather weak one of wave-length 4490. W. F. Hillebrand.

The Rare Elements. By V. Lenher. *Electrochemical In* *stry*, January and February, 1904.—A resumé of present iowledge on the occurrence, extraction and uses of radium, lium, rubidium, caesium, berryllium, gallium, indium, thalim, germanium, titanium, the rare earths, vanadium, uranium, lumbium, tantalum, molybdenum, tungsten, selenium, telrium and the platinum metals. As the article itself is a resumé, does not permit of being abstracted; it contains many items interest. J. W. Richards.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

Annual Reports Minister of Mines British Columbia, 1902, o pp.; 1903, 275 pp.; map, plates.—These reports contain a few says and partial analyses of ores, oil, etc. Elsewhere in this eview reference will be found to a supposed new element in a ring water from the Kootenay District.

W. F. Hillebrand.

Analyses of Rocks from the Laboratory of the United ates Geological Survey, 1880–1903. Tabulated by F. W. arke. *Bull. U. S. Geol. Survey, No. 228*, 375 pp.—The present bulation contains about 300 analyses more than its predecessor, illetin 168. In addition to the former rock names the present ition gives those demanded by the new quantitative classificain of Cross, Iddings, Pirsson and Washington. The introducin presents also a new computation of the average composition rocks of the earth's crust, based on more extensive data. In mentary form the percentage is as follows: O, 47.09; Si, .23; Al, 7.99; Fe, 4.46; Mg, 2.46; Ca, 3.43; Na, 2.53; , 2.44; H, 0.17; Ti, 0.43; Zr, 0.026—; C, 0.14—; P, 11; S, 0.11; Cl, 0.07—; F, 0.02+; Ba, 0.089; Sr, 0.034; n, 0.084; Ni, 0.023—; Cr, 0.034—; V, 0.02—; Li, 0.01. otal, 100.000. W. F. Hillebrand.

Description of the Mount Stuart Quadrangle [Washington]. George Otis Smith.—This is the descriptive text accomnying the *Mount Stuart Folio, No. 106, of the Geological Atlas the United States*, issued by the Geological Survey. The neral and economic geology are described, and illustrated by n analyses, made in the Survey laboratory, of the following cks: Serpentine, granodiorite closely approaching a quartzorite (tonalose), acid dike rock (tonalose), Teanaway and ikima basalts (vaalose), quartz-bearing olivine-diabase (tonase), gabbro (hessose), and a siliceous dolomitic rock from the -called "nickel-ledge" in the Peshastin formation. Nickel es have not been found yet in this region, though the presence this element in the large bodies of serpentine indicates that ey may be present. Rich but thin bands of cinnabar occur about the head of the Middle Fork of Teanaway River. Analyses of the Roslyn coal are also given. W. F. HILLEBRAND.

Geogenesis and Some of Its Bearings on Economic Geology. BY PERSIFOR FRAZER. *Trans. Am. Inst. Min. Eng.* (advance extra, Atlantic City meeting, February, 1904), 11 pp.—A statement of some of the views and arguments recently expressed regarding the planetesimal hypothesis of earth origin (this Review, **26**, R. 154, and the next following abstract of the present number). "While according to this new hypothesis every respect, it is neither necessary to discard with ignominy the nebular theory, nor even the hot fluid earth speculations hung upon it, . . "
W. F. HILLEBRAND.

The New Geology and Vein Formation. BY FRANK R. CARPENTER. *Proc. Colorado Sci. Soc.*, 7, 253–266.—The author discusses interestingly the bearing of Chamberlin's "planetesimal" hypothesis of earth-origin (this Journal, **26**, R. 154) on the formation of ore deposits. If the hypothesis is accepted, he asks if certain conclusions may not be legitimate, among them the following: (1) "The work done by meteoric water in the formation of metalliferous veins is local and comparatively shallow, and is confined to alteration, redeposition and to local enrichment. (2) Metalliferous ore-bodies in their original form are the result of a general process called vulcanism, which in some cases has formed intrusive or igneous veins, but in general they are the result of ascending volcanic waters and gases which were a part of the earth's original composition, and were not derived either from the sea or atmosphere, both of which are themselves the products of vulcanism, and the reason that metalliferous ore-bodies are most common in the regions of igneous rocks is not that they were derived directly from these rocks, so much as from the volcanic waters and gases which accompanied them. (3) In view of the second conclusion, fissure veins, after passing through the effects of surface alteration and concentration, are not likely to change materially within workable depths, and a progressive impoverishment which followed under the old view does not necessarily follow under the new. It therefore tends to reestablish the old view of the greater permanency of fissure veins." At a later date W. F. Edwards (*Ibid*, pp. 289–296) in discussion intimates his belief that geology as a practical working science will not be materially changed in any respect by the new hypothesis.
W. F. HILLEBRAND.

The Volcanic Origin of Natural Gas and Petroleum. BY EUGENE COSTÉ. *Jour. Canadian Mining Institute*, **6**, 73–123. **The Volcanic Origin of Oil.** BY EUGENE COSTÉ. *J. Franklin Inst.*, 157, 443–454; *Trans. Am. Inst. Min. Eng.* (advance extra, Atlantic City meeting, February, 1904), 10 pp.—The author of these papers is a very pronounced and vigorous upholder of the volcanic origin of natural oil and gas, and believes that "geology can to-day most clearly prove the origin of oil to be inorganic and the result of solfataric volcanic emanations," instead of its being a most obscure problem. Numerous arguments are advanced in support of his view. W. F. HILLEBRAND.

Some Notes on Vanadium. BY W. F. EDWARDS. *Proc. Colorado Sci. Soc.*, 7, 297–312.—A paper dealing briefly with the history of the element, the occurrence of its ores in the Rocky Mountain region, the uses of the metal and its salts, and, lastly, the methods for its detection and separation.
W. F. HILLEBRAND.

The Leopardite (Quartz Porphyry) of North Carolina. BY THOMAS L. WATSON. *J. Geol.*, 12, 215–224; figures.—This is a more detailed description than has before appeared of this long known rock, which takes its name from the black spots showing on certain surfaces of fracture. These are caused by similarly oriented pencils and dendritic forms of oxides of manganese and iron. No cause is apparent for their definite arrangement. The composition of the rock otherwise does not differ essentially from that of other quartz porphyries of the United States.
W. F. HILLEBRAND.

Quartz-Feldspar-Porphyry (Graniphyro-Liparose-Alaskose) From Llano, Texas. BY JOSEPH P. IDDINGS. *J. Geol.*, 12, 225–231.—This gray porphyry with the composition of a granite forms a large body, is very interesting petrographically, and may become so commercially. It shows abundant phenocrysts of red feldspar and opalescent blue quartz, the matrix being aphanitic to phanerocrystalline. The rock, is therefore, mottled red and gray with blue spots. The groundmass is composed of feldspar (microcline and albite) and quartz in nearly equal proportions, a little brownish green mica, and still less fluorite, magnetite, apatite, and zircon. The quartz phenocrysts contain multitudes of minute inclusions of two kinds, the one of thin colorless prisms resembling apatite rather than rutile, the other of equally thin brownish tabular crystals having the form and color of ilmenite. To reflection and interference phenomena caused by these inclusions, mostly thinner than a wave-length of light, is due the blue color of the quartzes. A partial analysis by S. H. Worrell, of the University of Texas Mineral Survey, and a more complete one by H. S. Washington show pretty close agreement for the most part with the composition calculated by the author from microscopical measurements of the constituent minerals. The following data are also furnished by the Texas Survey: Sp.

gr., 2.64 (corrected, 2.67). One cubic foot of the rock absorbs 9.47 ounces of water. Crushing strength, 15300 pounds per square inch. Dr. Washington's analysis shows: SiO_2, 75.90; Al_2O_3, 12.07; Fe_2O_3, 1.01; FeO, 1.45; MgO. 0.22; CaO, 0.65; Na_2O, 3.08; K_2O, 5.32; H_2O+, 0.41; H_2O-, 0.06; TiO_2, 0.38; P_2O_5, 0.15; Fl (microscopical estimation by Iddings), 0.49; CO_2, none; MnO, not determined. W. F. HILLEBRAND.

Annual Report of the State Geologist [New Jersey] for the Year 1903. xxxi+132 pp.; maps, plates.—The chemical matter of this report is confined to a few analyses of iron ores in the chapter on "Mineral and Cement Industries," and four partial ones of water taken from points in Barnegat Bay and Manasquan Inlet. W. F. HILLEBRAND.

The Occurrence and Exploitation of Petroleum and Natural Gas in Ohio. BY JOHN ADAMS BOWNOCKER. *Geol. Survey of Ohio, Fourth Series, Bull. No. 1*, 320 pp.; maps, plates.—Chemical matter is wanting in this report, but the concluding chapter on the "Origin of Oil and Gas and the Geological Conditions under Which They Are Found," after a brief statement of earlier theories, presents as apparently new the theory noticed in the next abstract by Charles B. Morrey, professor of bacteriology in the Ohio State University. It is difficult to see, however, wherein, as to its essential feature, it differs from that of F. C. Phillips (*Am. Chem. J.*, 16, 417), which is based on fermentation, notwithstanding the statement on p. 313 of the *Ohio Bulletin* that it does differ radically from it.

W. F. HILLEBRAND.

[Bacterial Theory of the Origin of Oil and Gas.] BY CHARLES B. MORREY.—Pages 313–315 of the publication noticed just above. Bacteria are the only other agent, save heat, which can produce from organic matter the same products as destructive distillation. In the Ohio fields the action of heat is excluded by geological evidence. Bacteria are known to have been present in the deposits of former geologic epochs. "In the formation of shales by stream deposits, wave action, and ocean currents, quantities of organic matter, largely vegetable, were deposited in the mud, giving rise to such shales, and along with this material, bacteria in enormous numbers. These bacteria, acting in the absence of air, would form marsh gas and heavier hydrocarbons just as takes place to-day. This decomposition would go on not only in shallow water but also at great depths, as experiments have shown that the action of bacteria is not prevented by a water pressure of 600 atmospheres corresponding to a depth of more than 15000 feet of water. Bacterial decomposition would continue until all the organic matter was broken up into compounds no longer capable of being attacked—the hydrocarbons among others—or until the bacteria were killed by an accumulation of their own products. In the latter case we should probably find a much higher percentage of carbon as in coal, than we have in oil or gas. Or the decomposition could also have been stopped by the drying out of the shales. * * * Where animal remains in larger quantities were decomposed we would have not only the hydrocarbons but also various nitrogen and sulphur compounds exactly as we find in limestone oils." W. F. HILLEBRAND.

The Stone Reefs of Brazil, their Geological and Geographical Relations, with a Chapter on the Coral Reefs. BY JOHN CASPER BRANNER. *Bull. Mus. Comp. Zool., Vol. 45, Geol. Series, Vol. 7,* 285 pp.; numerous maps, plates, figures.—Along a great extent of Brazilian coast occur sandstone reefs whose origin has excited much interest. They consist to about two-thirds mainly of quartz sand, derived, in all probability, from granitic rocks, cemented by dolomitic calcium carbonate. The probable sources of this cementing material and its mode of deposition are quite fully considered, but without the formulation of very definite conclusions of general application. Analyses of the rock and the binding material are given, also of coral reef rock and living corals. Whereas the latter are almost free from magnesium, the old or dead rock is found to have become appreciably dolomitized under the influence of sea-water, an observation in agreement with earlier observations elsewhere by Dana and others.

W. F. HILLEBRAND.

The Tin Desposits of the York Region, Alaska. BY ARTHUR J. COLLIER. *U. S. Geol. Survey Bull. No. 229,* 57 pp.; maps, plates, figures.—This report summarizes the information of value to the prospector in regard to the occurrence of tin in Alaska and elsewhere. The former occurrences are all described in more or less detail, both those visited by members of the survey and others less well authenticated. The tin-bearing area of the York Peninsula covers about 450 square miles, but reported discoveries to the northeast indicate its extension for 100 miles in that direction. Developments are as yet insufficient to demonstrate the profitableness of the deposits, but some of them will probably prove of value. "The ore occurs in both alluvial deposits and in ledges. The ore of the alluvial deposits has been traced in some cases to small veinlets and vugs in the slate country rock, where it has no visible connection with intrusions of granite or other igneous rock, and in others to well-defined dikes or veins of greisen. This lode ore is associated with granite or other silicious, igneous, intrusive rocks, that have been altered to true greisen like that occurring in nearly all productive tin regions. In one case the cassiterite occurs disseminated through a greisen composed of quartz, calcite, fluorite, and lithia mica. In another case the tinstone is intimately associated with tourmaline contained in veins in the granite. The granites in which tin ore has been found are intruded in limestones of Silurian age in one case and probably of Carboniferous age in another." The mineral stannite is far subordinate to cassiterite. The report contains the results of a few assays and tests and an analysis of ore from Lost River. W. F. HILLEBRAND.

The Geology and Ore Deposits of the Bisbee Quadrangle, Arizona. BY FREDERICK LESLIE RANSOME. *U. S. Geol. Survey, Professional Paper, No. 21*, 168 pp.; maps, plates.—The magnificent specimens of malachite and azurite, for which this district was once so noted, are no longer found, the ores being mainly unoxidized sulphides. The producing ore bodies are in limestones, which are cut by dikes, sills, and stocks of igneous rocks. It is in the neighborhood of one large stock—Sacramento Hill—that the large ore bodies mostly occur. The igneous rocks are chiefly intrusions of granite magma, ranging in texture from rhyolite and rhyolite-porphyry to granite (grano-liparose). Metasomatic alteration, including pyritic mineralization followed by oxidation and its attendant phenomena of transportation and enrichment, have operated to form the ore bodies now exploited. The primary minerals are cupriferous pyrite with perhaps a little chalcopyrite, sphalerite, and galena. Associated with them are tremolite, diopside, grossularite, vesuvianite, quartz, and chlorite in the limestones; quartz, sericite, chlorite, perhaps kaolin, and a little epidote in the granite-porphyry; and quartz and sericite in the Pinal schist. The source of the ore material is not known. Chalcocite is the most important sulphide mineral in the profitable ore bodies, and the evidence of its secondary formation, by the action of descending solutions of oxidized copper salts on undecomposed sulphides, is complete. The following equation by H. N. Stokes may express its formation:

$$5FeS_2 + 14CuSO_4 + 12H_2O = 7Cu_2S + 5FeSO_4 + 12H_2SO_4.$$

In the zone of oxidation cuprite and native copper are among the first minerals to form from the sulphides. Direct alteration of chalcocite to native copper was observed. In one mine the following sequence was noted: Native copper, cuprite, brochantite, melanochalcite, chrysocolla, malachite, calcite. The formation of limonite appears to accompany or closely follow that of cuprite, and azurite belongs generally to a later stage of the general oxidation than malachite. Tenorite is found with wad in the upper part of the zone of oxidation. A few analyses of igneous rocks, and of unaltered and altered limestones, by chemists of the survey, appear in the report. W. F. HILLEBRAND.

ANALYTICAL CHEMISTRY.

Rapid Method for Determining Total Sulphur in Iron by Evolution. BY S. S. KNIGHT. *Iron Age*, February 25, 1904.

The sample of 2 grams is mixed with 1 gram of purest iron dust obtained by hydrogen, the sulphur content of which was previously determined. The mixture is put in a small porcelain crucible, 1 gram of the iron dust placed on top, and a small disk of quantitative filter-paper. The lid is put on and the whole heated ten minutes at the highest heat of a blast-lamp. It is then cooled partly, placed in an evolution flask and the evolved gas absorbed in ammoniacal solution of calcium chloride and titrated with iodine solution. The results are exactly the same as by standard gravimetric methods, and by Walter's and Miller's method, while the time required is less than thirty minutes.

J. W. RICHARDS.

Total Sulphur and Different Forms of Sulphur in Pig and Cast Iron. BY G. T. DOUGHERTY. *Iron Age*, March 31, 1904. —Criticizing the results of Knight (see previous abstract), the author says it is identical with his method proposed in the *Iron Age*, May 8, 1902. Titaniferous pig-irons are the only kinds not yielding all their sulphur by the evolution method; in these irons, more sulphur may remain in the insoluble residue than is evolved. Strong potash solution (17 per cent.) is preferable to ammoniacal cadmium chloride solution for absorbing the hydrogen sulphide. By continuing the annealing to thirty minutes, practically all the sulphur may be obtained from these titaniferous irons. Sulphur exists in iron in three forms, one insoluble in hydrochloric acid, another evolved as organic sulphur compounds, the third evolved as hydrogen sulphide. The latter is the only kind occurring in steel; the first occurs principally in titaniferous pig iron.

J. W. RICHARDS.

METALLURGICAL CHEMISTRY.

Pig Iron Production by Grades. *Eng. Min. J.*, March 17, 1904. (Bulletin American Iron and Steel Association.)—Of the 18 million tons of pig iron made in the United States in 1903, 55.5 per cent. was Bessemer and low-phosphorus iron, 11.3 per cent. basic pig, 4.3 forge iron, 24.5 foundry and high silicon, 2.6 malleable Bessemer pig, 0.7 white and mottled, 0.9 spiegeleisen, and 0.2 per cent. ferro-manganese. Pennsylvania led in Bessemer and low-phosphorus pig and in forge iron; Alabama in foundry iron.

J. W. RICHARDS.

Value of Raw Material in Making Pig Iron. BY A. P. GAINES. *Iron Age*, April 14, 1904—A summary of 11 rules by which the relative values of different ores, fluxes and fuels for the blast-furnace may be determined. The data given apply to Alabama practice, and are in many respects similar to those given some years ago by Gordon. The slag assumed is one in which the sum of silica and alumina equals the sum of all protoxide bases. The manufacturing cost is given as $1.80 per ton of pig iron, when 9500 pounds of material are put into the furnace per ton of iron made. The heating value of fixed carbon in the furnace is taken as 3700 calories per kilogram, while 2950 calories are assumed necessary to reduce and fuse the iron, including carbon absorption and radiation, and 1241 calories are assumed necessary to melt a unit of slag allowing for loss by radiation, etc. The latter value appears very high. The rules are based on these assumptions, and are so condensed as not to allow of abstracting. They are apparently quite practical, and will be of value to blast-furnace managers. J. W. RICHARDS.

Scattering Ore Dust. *Iron and Machine World*, April 2, 1904.—The Supreme Court of Pennsylvania has granted a perpetual injunction against the Jones and Laughlin Steel Company of Pittsburg, forbidding them operating their blast-furnaces so as to send out the clouds of red ore dust which have become a nuisance to the surrounding villages. The only recourse of the company is now to wash the gas, which Julian Kennedy considers perfectly feasible, by which 99 per cent. of the dust can be removed. J. W. RICHARDS.

Hearth Area and Number of Tuyeres. BY F. L. GRAMMER. *Iron and Steel Metallurgist*, March, 1904. (Read before American Institute of Mining Engineers.)—The 100-foot blast-furnace has not always proved as advantageous as the 90-foot, and the increase of the number of tuyeres from 8 to 12 or even 20 has often resulted in decreased output. The proper number must be determined from the hearth diameter, the fuel and ore used, and the grade of metal desired. As far as reducing blast pressure is concerned, no advantage is gained by exceeding 8 tuyeres, since above this the decreased resistance in the furnace is more than offset by the increased tuyere resistance. With the same hearth and volume of blast, the blast pressure using 16 tuyeres will be 1 to 2 pounds more than when using 8. Modern American practice is to have 3 to 3.5 cubic feet of crucible capacity and 20 to 30 cubic feet total furnace capacity per ton of metal produced in twenty-four hours. J. W. RICHARDS.

Calcining Lime for Use in Basic Open-hearth Furnaces. BY D. BAKER. *Iron Age*, April 21, 1904.—The great development of the basic pig and ore process has required the use of calcined lime low in sulphur. When the limestone was calcined by using coal carrying 2.25 per cent. of sulphur, the burnt stone carried an average of 0.22 per cent. sulphur, the outside of the lumps being as high as 1.1 per cent. sulphur. Gas from Otto-Hoffman ovens was next tried, carrying 500 grains of sulphur per 100 cubic feet, but this gave still higher sulphur in the lime. Using as fuel tar with 0.25 per cent. sulphur, a lime with as low as 0.11 per cent. was obtained, but the cost of the tar was prohibitive. Finally, the gas was used, but first washed by passing through scrubbers containing bog ore, thus extracting 95 per cent. of the sulphur. It requires 10,000 cubic feet of gas per ton of lime, costing 40 cents, while the cost of ore in the scrubbers is 4 cents, and of labor 16 cents, making a total cost of 60 cents per net ton of lime above the cost of the stone. J. W. RICHARDS.

Investigations in Cast Iron. BY A. E. OUTERBRIDGE, JR. *J. Franklin Inst.*, February, 1904.—A bar of cast-iron, as cast, was 14$^{13}/_{16}$ inches long by 1 inch square; by alternately heating and cooling many times, its size increased until it was 16.5 inches long and 1$^{1}/_{8}$ inches square. The expansion in volume is from 14 81 to 20.88 cubic inches, an expansion of 41 per cent. The increase takes place most rapidly at 1450° F (788° C.); the above bar was heated 27 times to this temperature, cooling slowly over night each time. Micro-photographs (made by Mr. Job, of Reading, Pa.) show that the crystals of iron have pushed out in all directions and not returned to their original positions, eaving spaces or cracks between them. A steel bar contracted $/_{8}$ inch to the foot by the same treatment. The iron loses about 30 per cent. in strength. Pieces of machinery made or worn too small, can be expanded to full size by this method.
J. W. RICHARDS.

The Clifton District, Arizona. *Eng. Min. J.*, April 28, 1904. —An illustrated description of this well-known copper district, now producing 60,000,000 pounds of copper a year. The Detroit smelter has in operation a Rachette furnace 264 inches by 12 inches at the tuyeres and 13 feet in depth, having 20 tuyeres on a side, each 4.5 inches in diameter, air being supplied by a Connersville blower furnishing 20,000 cubic feet per minute. The ore averages 11 per cent. of copper, about 45 per cent. of it being concentrates and flue-dust. The matte is blown directly o high-grade blister copper in barrel-shaped converters 5 feet 6 nches in diameter by 8 feet long. J. W. RICHARDS.

The Relation between Arsenic and Electromotive Force in Copper Electrolysis. BY L. W. WICKES. *Electrochemical Industry*, April, 1904. (Read before American Institute of Mining Engineers).—Three copper arsenic alloys were made, containing .56, 2.24 and 0.96 per cent. of arsenic, and used as anodes. The percentage of arsenic in the cathode was found to be a function f the current density, and therefore indirectly of the voltage used on a given cell, and directly a function of the degree of hydrolyzation of the arsenic sulphate. The arsenic passes into solution as sulphate, and in solution it hydrolyzes to arsenate. When hydrolyzed it cannot be deposited, and therefore, since hydrolyzation is a function of time, the more time allowed for this process the less arsenic will be deposited on the cathode from the arsenic sulphate. This time depends, in turn, on the amperage used. J. W. RICHARDS.

A New Brass Melting Furnace. *Metal Industry*, February, 1904.—Description of the Rockwell furnace, which consists of two barrel-shaped cylinders, end to end, fired by oil, and used alternately, so that the fresh charge in one is heated up by the waste gases from the other. The charge is 350 up to 3,000 pounds in each chamber, and melting is very rapid because of the regenerative feature. J. W. RICHARDS.

Making Brass Castings in Metal Molds. *Metal Industry*, February, 1904.—Porosity and unsoundness generally result from casting brass in metal molds. This can be avoided by painting the surface of the mold, about once a day, with aluminum paint, which will cause the brass to lie against the surface and be free from porosity and roughness. The objects thus cast in metal molds are sounder and more homogeneous than those cast in sand. J. W. RICHARDS.

Brass-plating Solutions. BY F. P. DAVIS. *Metal Industry*, April, 1904.—Carbonate of copper is prepared by precipitating copper sulphate by sodium carbonate and washing with hot water till free from acid or alkali. Carbonate of zinc is prepared in the same way. A solution of 6 or 7 ounces of potassium cyanide per gallon of water is prepared, and the carbonates dissolved in it in the proportions of two parts copper carbonate to one part zinc carbonate. Aqua ammonia is then added, one gallon to one hundred of solution, a small amount of potassium cyanide added, and the bath is used warm at 100° to 110° F. The density of solution should not be over $5^{1}/_{2}$° Baumé. A small amount of As_2O_3 dissolved in the bath will brighten the deposit. The anode should be of clean, annealed, soft, yellow brass, larger than the cathode, and removed when the bath is not in use. The current should be double or more than that used for nickel-plating; the work should be 5 to 6 inches from the anodes. The bath can be renewed by additions of copper carbonate dissolved in potassium cyanide, and of zinc carbonate dissolved in aqua ammonia. Need of zinc is shown by the deposit becoming dull and reddish at parts most distant from the anode; need of copper by a bright pink color, passing into dull and greenish-white. One to three minutes gives a rich, lemon-yellow color, which will darken under lacquer to the required shade. For heavy deposits the baths are run cold and contain more metal, having a density of 8 to 15° Baumé. J. W. RICHARDS.

The Tin Deposits of Alaska. *Iron Age*, April 7, 1904. (Extracts from Bulletin of U. S. Geological Survey, by A. J. COLLIER). See this Journal, **25**, R. 225, 463; this Review, **26**, 339.

Tin Mine in South Carolina. *Iron and Mach. World*, April

9, 1904.—A mine is being worked near Gaffney, S. C., the ore from which is said to run 35 per cent. of tin. The present output is a ton of ore a day, and one carload of 25 tons has been shipped to Cornwall, for smelting. A boulder of cassiterite weighing over 1,000 pounds was found, which will be sent to the St. Louis Exposition and afterwards to the Smithsonian Institution.

J. W. RICHARDS.

A New Quicksilver Mining District. BY M. P. KIRK AND J. W. MALCOLMSON. *Eng. Min. J.*, April 28, 1904.—The Marfa and Mariposa Company, of Terlingua, Texas, has been shipping about 400 flasks of mercury per month for over two years. A new district 11 miles east of this has now been found, the ore running 0.25 to 2 per cent. mercury, averaging 0.6 per cent. The new district is called "Big Bend," being near a large bend in the Rio Grande. The cost of mining is $3 per ton; treatment in Scott furnaces at Terlingua, $0.75 per ton, extracting over 90 per cent. of the mercury. The value of the mercury obtained is $6.00 per ton of ore. The Big Bend Cinnabar Mining Co. has commenced erecting a 50 ton Scott furnace on their property.

J. W. RICHARDS.

The Corrosion of Aluminium and Its Prevention. BY W. R. MOTT. *Electrochemical Industry*, April, 1904.—If aluminium is used as anode in certain solutions, such as sodium acid phosphate, a film forms which is many times thicker and chemically different from the ordinary film forming in air, and which has a protective influence on the metal. Hydrochloric acid, caustic soda and sulphuric acid act on the metal protected by this film much more slowly than on the unprotected metal. The protective action is greater the higher the voltage used in making the film. Suggestion is made that all aluminium articles which receive much handling, as well as exposed aluminium electrical conductors near the sea-coast, should receive this treatment to diminish corrosion.

J. W. RICHARDS.

Electroplating upon Aluminium. BY C. F. BURGESS AND C. HAMBUECHEN. *Electrochemical Industry*, March, 1904.—Deposits have been obtained by the writers which have stood the test of a year's time without any sign of deterioration. The aluminium article is immersed a few minutes in hydrofluoric acid, which roughens the surface, then rinsed in running water, dipped a few seconds in a mixture of 100 parts concentrated sulphuric acid and 75 parts concentrated nitric acid, rinsed again, and transferred to a zinc-plating solution, consisting of a mixture of zinc and aluminium sulphates of density 15° Baumé, and containing 1 per cent. of hydrofluoric acid or an equivalent amount of potassium fluoride. Zinc is there deposited ten to fifteen minutes with a current density of 10 to 20 amperes per square foot, then removed, washed and dried. It is then given a coat-

ing of copper, gold or silver from their cyanide solutions, using only such precautions as are usual when plating on zinc.
J. W. RICHARDS.

Alumino-thermics. BY E. STÜTZ. *J. Franklin Inst.*, April, 1904.—A lecture illustrating the Goldschmidt method of welding iron and obtaining pure metals by the use of powdered aluminium. In addition to information already published, statements are made that the strength of a rail-weld is 80 per cent. of the original material; that steel girders for construction work can be welded together cheaper than they can be riveted. To repair a break in a 12-inch shaft takes 190 pounds of 'Thermit', furnishing 95 pounds of melted mild steel containing 0.1 per cent. of carbon, to which 0.5 per cent. of manganese can be added if desired. By introducing the mixture, containing some titanium, into melted steel, the ingots are made more sound and the titanium combines with dissolved nitrogen. J. W. RICHARDS.

ORGANIC CHEMISTRY.

An Abnormal Result in the Hydrolysis of Amygdalin. BY J. WALLACE WALKER AND W. S. HUTCHINSON. *Trans. Roy. Soc.*, (Canada), 1902, Sec. III, 117–119.—As is well known, when amygdalin is hydrolyzed with strong hydrochloric acid laevo-rotatory mandelic acid is produced. If the amygdalin is boiled with alkalies, the nitrogen is split out as ammonia, and a quantitative yield of active amygdalinic acid is obtained. Hydrolysis of this active amygdalinic acid with hydrochloric acid, however, does not yield the active mandelic acid but the inactive form, the inversion therefore occurring when the hydrogen atom takes the place of the glucose radical. The conditions of the experiment were varied in many ways, but only inactive mandelic acid could be obtained. M. T. BOGERT.

o-, m- and p-Tolyl-diphenyl-carbinol. BY S. F. ACREE. *Ber. d. chem. Ges.*, 37, 990-994.—*p-Tolyldiphenylcarbinol*, $(C_6H_5)_2C(OH)C_6H_4CH_3$, was prepared from sodium phenyl and phenyl *p*-tolyl ketone, from sodium *p*-tolyl and benzophenone, and also by the action of *p*-tolyl magnesium bromide on benzophenone. It melts at 74° C., and yields triphenylcarbinol-*p*-carbonic acid, $(C_6H_5)_2C(OH)C_6H_4COOH$, when heated with 20 per cent. nitric acid in a sealed tube at 150°–160°. *o-Tolyldiphenylcarbinol*, from *o*-tolyl magnesium bromide and benzophenone, melts at 98°, is very easily soluble in benzene or ether, and but slightly soluble in cold ligroin. *m-Tolyldiphenylcarbinol*, from *m*-tolyl magnesium bromide and benzophenone, or from phenyl magnesium bromide and *m*-toluic acid ethyl ester, is somewhat hygroscopic, and melts at 65°. The compound given this name by E. and O. Fischer (*Ann. Chem.* (Liebig) **194**, 283), and melting at 150°, is probably not *m*-tolyldiphenylcarbinol at all,

but *m*-diphenylmethylbenzyl alcohol, $(C_6H_5)_2CHC_6H_4CH_2OH$. *m-Brom toluene* can be prepared from *m*-toluidine by the Sandmeyer reaction easily and rapidly, the yield being 50 per cent. to 75 per cent. of the theory (details of the method are given).
M. T. BOGERT.

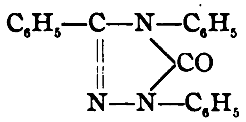
A Correction. BY S. F. ACREE. *Ber. d. chem. Ges.*, 37, 995.—In a previous paper (*Ber. d. chem. Ges.*, 37, 622), the author reported the preparation of the ethyl ester of phenylsemicarbazide-α-carbonic acid from the silver salt and ethyl iodide. Having since found that the silver salt used for this purpose contained a small amount of the ester, the author will repeat the experiment with a pure product. M. T. BOGERT.

The Molecular Rearrangement of Aminophenyl Alkyl Carbonates. BY J. STIEGLITZ AND HENRY T. UPSON. *Am. Chem. J.*, 31, 458–502.—Attention has been called in a previous article to the fact that *o*-aminophenyl ethyl carbonate easily rearranges to oxyphenylurethane, $H_2NC_6H_4OCO_2C_2H_5 \rightarrow C_2H_5O_2CNHC_6H_4OH$. The present work was carried out to ascertain to what extent the tendency to rearrange exists in the case of substitution products of *o*-aminophenyl ethyl carbonate, whether the amines and their salts can be isolated, and particularly to determine the velocity of the rearrangement and the factors upon which the latter depends. As to the first two points, it was observed that all twelve of the *o*-aminophenyl carbonates investigated show the tendency to rearrange into urethanes, and that in every case the chloride of the amine can be isolated, even when the velocity of rearrangement under ordinary conditions is an extremely high one. The present paper deals only with the work on the velocity of the rearrangement of these bodies when their chlorides are dissolved in water or in dilute alcohol. The rearrangement of the chlorides is shown to be a simple monomolecular one of the free base formed by hydrolysis, proceeding all the time according to the monomolecular equation at a rate of change proportionate to the free base present at any moment; simultaneously the free acid accumulating suppresses the free base and retards the apparent rate of change, but does not affect the real rate of change as referred to the concentration of the base. The methods used are described in full, the results tabulated and interpreted. M. T. BOGERT.

Ammonium Sulphocyanate and Thiourea as Sources of Nitrogen to Fungi and Micro-organisms. BY JOSEPH H. KASTLE AND ELIAS ELVOVE. *Am. Chem. J.*, 31, 550–557.—Nutritive solutions, containing ammonium sulphocyanate and inoculated with *Penicillium glaucum*, showed a plentiful growth of the green mold, while similar tubes containing thiourea instead of ammonium sulphocyanate showed practically no growth of the mold. In the ammonium sulphocyanate it is the nitrogen of the ammonium radical which is available for the mold, since tubes containing potassium sulphocyanate showed no more growth than those containing thiourea. Similar results were obtained with yeast and with the nitrifying organisms of the soil. In the latter case, ammonium sulphocyanate is slowly nitrified, while thiourea is apparently unattacked. By the action of hydrogen dioxide alone, or in the presence of calcium chloride and manganous chloride, thiourea yields no nitrite, while ammonium sulphocyanate under the same conditions produces a measurable amount. M. T. BOGERT.

A New Reducing Agent for the Preparation of Thiophenol. BY W. P. WINTER. *Am. Chem. J.*, 31, 572–577.—In the Otto process for the preparation of thiophenol, benzenesulphone chloride is first reduced with zinc dust to zinc benzenesulphinate, and then, by further action of zinc, to phenyl disulphide and thiophenol. The author finds that the reduction of the sulphinate to thiophenol can be accomplished more rapidly and efficiently by the use of stannous chloride with subsequent addition of a little zinc dust, the yields of thiophenol thus obtained approaching close to the theoretical. M. T. BOGERT.

On Isomerism in the Amidine Series: Diphenylbenzenylaminoamidine and Phenylbenzenylaminoamidine. BY HENRY L. WHEELER AND TREAT B. JOHNSON. *Am. Chem. J.*, 31, 577–584.—Acree recently (*Am. Chem. J.*, 27, 120 (1902)) described a compound which he called "1-phenyl-2 hydro-3-ethoxyurazole." The author has prepared this compound and finds that it is a 3,5-diethoxyurazole. He also differs with Acree as to the likelihood of the existence of tautomeric forms of such compounds. The isomeric amidines obtained by von Pechmann from phenylhydrazine and benzanilidimide chloride are shown not to be desmotropic forms at all, but to differ structurally, thus: $C_6H_5NHN:C(C_6H_5)NHC_6H_5$ or $C_6H_5NHNHC(C_6H_5):NC_6H_5$, and $H_2NN(C_6H_5)C(C_6H_5):NC_6H_5$. The former of these (m. p. 119° C.), when treated with nitrous acid, gave a quantitative yield of benzenyldiphenylamidine, while with benzoic anhydride it gave a *benzoyl derivative*, m. p. 136°, which crystallized from alcohol in colorless rhombic plates. The other isomer (m. p. 174°–175°), when treated with phosgene, gave 1,3,4-triphenyl-1,2,4-triazolone,



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m. p. 217°–218°, but with benzoic anhydride no benzoyl derivative could be obtained. The amidine melting at 119° unites vigorously with phenyl mustard oil to form a cream-colored powder, not melting at 345°, and very difficultly soluble in benzene or alcohol. The isomeric amidine (m. p. 174°) combines far less vigorously with phenyl mustard oil, and gives an entirely different compound, m. p. 186°, which crystallizes in needles.

M. T. BOGERT.

BIOLOGICAL CHEMISTRY.

On the Reduction of Nitrates by Certain Plant Extracts and Metals, and the Accelerating Effect of Certain Substances on the Progress of the Reduction. BY J. H. KASTLE AND ELIAS ELVOVE. *Am. Chem. J.*, 31, 606–642.—The purpose of the investigation was to find out whether the aqueous extracts of certain plants had the power of reducing nitrates to nitrites. The extract employed was that of the potato. Aqueous extract of the potato is capable of reducing nitrates (those of sodium, potassium and ammonium) to the corresponding nitrites. The amount of nitrite found increases with the rise of temperature, reaching a maximum at 40°–45°, above which it begins to decrease in amount becoming nil at 100°. The amount of nitrite found increases with the quantity of potato extract present. The reduction of nitrates by the aqueous extract of the potato is completely inhibited or checked by mercuric chloride, chloroform, resorcinol, and alkalies. Its activity is greatly lessened by phenol, phenylhydrazinehydrochloride, sodium hypophosphite, hydroquinone, hydroxylamine hydrochloride, benzenesulphinic acid, sodium fluoride, and hydrocyanic acid. A considerable number of substances, notably alcohols and aldehydes have the power of greatly accelerating the reduction of nitrates by potato extract. The effect of temperature on the reduction is essentially the same, both in the presence or absence of the accelerator. The longer the nitrate and the potato extract in the presence of an accelerator are allowed to stay together, the greater will be the reduction, although the reaction is not proportional to the time interval. The more nitrate that is present the greater will be the reduction, and the more potato extract present the more nitrate will be reduced in the presence of accelerators. Up to a certain maximum point the greater the quantity of accelerator present the greater will be the reducing action. As a class, acids exercise an inhibitory influence on the progress of the reduction in the presence of an accelerator. Of twenty different kinds of plants examined, only one other (egg-plant) was found capable of yielding an extract that would reduce nitrates to nitrites. The macerated pulp of potato sprouts was even more active than the extract of the potato itself.

F. P. UNDERHILL.

Experiments on the Physical Structure of the Protoplasm of Paramoecium and Its Relation to the Reactions of the Organism to Thermal, Chemical and Electrical Stimuli. By Arthur W. Greeley. *Biol. Bull.*, 7, 3–33.—Precisely those chemical changes in the surrounding medium, which modify the structural reactions of the protoplasm of *paramoecium* to solutions of electrolytes, modify also the reactions of the organism to electrical and chemical stimuli. The protoplasm of *paramoecia* from an alkaline culture is liquefied by temperatures between 25° and 30°, by anions, and at the cathode during the passage of the constant current. The *paramoecia* also react positively to all these chemical and physical conditions. The protoplasm of the same *paramoecia* is coagulated by temperatures below 20° and above 30° by cathions, and at the anode during the passage of the current. The organisms are negative to all these conditions. The structural changes produced by electrolytes are partially reversed in *paramoecia* from a slightly acid culture, and the reactions of the organisms are also partially reversed to the electric current, completely so to solutions of electrolytes. In every case the reaction of a *paramoecium* to an external stimulus leads it to remain under those conditions which liquefy the protoplasm. Attraction is accompanied by liquefaction, repulsion by coagulation. As far as the physical structure of the protoplasm is concerned, the conclusion from these facts seems to be that the protoplasmic particles are physically identical with colloidal particles. Hence the protoplasm of *paramoecium* is essentially a colloidal solution whose particles carry a definite charge of electricity. The sign of this charge appears to depend on certain external chemical conditions of which the alkalinity of the surrounding medium may be taken as one of the most important. The sign of this charge is seen to determine not only the structural modifications of the protoplasm, but also the reactions of the *paramoecia* to chemical and electrical stimuli. This conception of the physical structure of protoplasm is also to explain the effect of external conditions on the processes of cell division, growth and movement through the operation of the laws of surface tension.

F. P. Underhill.

Haemolysins in Human Urine. By Roger S. Morris. *Am. J. Med. Sci.*, 127, 1026–1032.—In cases of pernicious anaemia the presence of haemolysins in the urine was demonstrated.

F. P. Underhill.

The Envelope of the Red Corpuscle and Its Rôle in Haemolysis and Agglutination. By S. Peskind. *Am. J. Med. Sci.*, 127, 1011–1026.—Various facts of a histological, chemical and physical character show that the red blood corpuscles possess an envelope. From the action of hydroxylamine hydrochlorate which produces sharply circumscribed accumulations of nitrogen gas on the periphery of blood corpuscles and not an extensive separation of the envelope from the contents underneath, it appears most probable that the envelope is not a differentiated membrane, but a part of the stroma which is condensed to form the surface layer of the corpuscle. The envelope is haemoglobin-free and consists of nucleoproteid, cholesterin, lecithin, and mineral constituents. It is elastic, smooth, and apparently possesses a certain glaze which prevents the agglutination of normal corpuscles with each other and makes the corpuscles less accessible to the action of toxins. Agglutination of blood corpuscles is due to an effect on the envelope produced by various biological products and chemical reagents, whereby the envelope is made sticky. Agglutinins, by modifying the envelope, probably lower the resistance of blood corpuscles toward toxins and other agents. From the fact that in nature they almost always occur in company with a haemolysin, the suggestion is offered that the agglutinins bear some coöperative relation to the haemolysins similar to that existing between the intermediary body and the complement, which likewise are usually coexistent in nature. The "resistance" of blood corpuscles depends in large part upon the condition of the envelope. The latter may be made to deteriorate by various agents, principal among them being the toxins of disease. Deterioration of the envelope may be partial or complete. So-called "vacuolization of the haemoglobin" can be explained satisfactorily on the assumption of a minute lesion in the envelope which allows the surrounding fluid to enter and thus permits of a localized laking at this point. The function of the envelope is in part, to make possible various metabolic processes, principal among which is the complex process known as internal respiration. This is accomplished through the medium of a selective permeability. Another important use of the envelope is to protect the corpuscles from the action of various substances deleterious to the latter. But the very chemical constitution of the corpuscles may at times serve for the undoing of the corpuscles, since it has been well shown by Ransom, Kyes, Sachs, and others that the cholesterin and lecithin of the envelope fix certain toxins and thus act as intermediary bodies.

F. P. UNDERHILL.

Observations on the Presence of Ethereal Sulphates, Taurine and Glycine in the Lower Animals. BY AGNES KELLY. *Hofmeister's Beiträge*, 5, 377–384.—In many of the forms of invertebrate life a considerable quantity of ethereal sulphates was found. The presence of taurine was noted in the muscles and organs of *Bojanus* of *Pecten opercularis* and *Mytilus edulis*. Glycocoll, in large quantity, was found in the muscles and organ of

Bojanus of *Pecten opercularis*, but could not be detected in the corresponding organs of *Mytilus edulis*. F. P. UNDERHILL.

The Influence of External Hemorrhage on the Chemical Changes in the Organism, with Particular Reference to Proteid Catabolism. BY P. B. HAWK AND W. J. GIES. *Am. J. Physiol.*, 11, 171–237.—External hemorrhage, equal to from 3 to 3.5 per cent. of the body weight, of dogs, was observed to cause the following more important effects: In well-nourished animals, in weight and nitrogen equilibrium, and fed continuously on a diet of constant composition, there was a temporarily increased output of nitrogenous and sulphur-containing products in the urine, and a variable effect on the elimination of phosphorized substances, though mainly a decreased excretion of the latter. Total solids in the urine were increased with the nitrogen and sulphur catabolism. These effects were relatively slight after one bleeding of moderate amount, but became more marked and lasted longer with repeated losses of blood. Healing of the necessary wounds in the operations, material lapped from these wounds, disturbance of the circulation in the part fed by the artery from which blood was taken, and associated influences, combined to produce a part though only a minor share of the observed catabolic effects. The increased elimination of the catabolic products referred to above occurred only in the urine. The amount, consistency and composition of the faeces were apparently unaffected by the hemorrhage. Digestion did not appear to be materially disturbed at any time, even after several severe hemorrhages at short intervals. There was little or no effect on intestinal putrefaction. Body-weight steadily declined on the original equilibrium diet after each bleeding. When the animal was allowed to eat freely, hemorrhages were followed by gradually increased weight. Moderate loss of blood markedly increased the appetite and caused thirst, even during periods when the animal was receiving an excess of food. Excessive losses of blood had temporarily an opposite effect. The volume of the urine and its specific gravity fell at first after hemorrhages then rose far above the average for several days, returning shortly to the usual quantity. With each succeeding hemorrhage the low volume for the first twenty-four hours was slightly increased, but the cumulative rise after the first twenty-four hours became more decided and was longer continued. Hemorrhage caused an immediate stoppage of the *formation* of urine, a subsequent retardation of flow, and a decided stimulation. On returning the blood (defibrinated), urine immediately began to form, and flowed under special stimulating influences. Hemorrhage inhibited the hypersecretion of saliva during ether anaesthesia. The urine was always decidedly acid in reaction before hemorrhage, slightly amphoteric occasionally. After hemorrhage, however, it was strongly amphoteric for several days. The only observed abnormality of the urine was a transient glycosuria. This appeared to be due solely to the anaesthetic. Effects on respiration, heart-beat, blood-pressure, and on the qualities of the blood, such as the number of leucocytis, leucocytosis, and clotting tendency, were essentially the same as those repeatedly observed by others. After successive hemorrhages, the percentage-content of proteid and nitrogen in the blood gradually fell; that of phosphorus, sulphur, and ash remained practically stationary. Specific gravity fell, and water-content rose in each sample of blood, even when taken at very wide intervals. Light ether anaesthesia, in these experiments, caused decreased elimination of sulphur and nitrogen, but increased output of chloride and total solids in the urine, with no special effect on specific gravity and none on phosphorus metabolism. For about twenty-four hours after light anaesthesia, urinary volume was markedly increased. After twenty-four hours there was a corresponding temporary fall below the average daily volume. Ether caused a transient glycosuria.

F. P. Underhill.

On Some Uses of Naphthoquinin Sulphonic Acid. By P. Ehrlich and C. A. Herter. *Ztschr. physiol. Chem.*, 41, 379–393.—An investigation into certain color reactions given by the above substance with a large number of organic compounds, and which may serve as a test for certain biological syntheses.

F. P. Underhill.

The End-products of the Self-digestion of Animal Organs. By P. A. Levene. *Ztschr. physiol. Chem.*, 41, 393–404.—A comparative study of the autolysis of different organs has been begun by this investigator in the hope of thus throwing some light upon the metabolic processes in life since autolysis is, according to Levene, similar to the processes going forward in metabolism. In this investigation the products of the autolysis of the pancreas and liver were investigated. Alanin, aminovalerianic acid, leucine, pyrrolidine carbonic acid, glutaminic acid, phenylalinin, uracil and thymine were obtained from the autolysis of the pancreas, while the autolytic digestion of the liver yielded glycocoll, leucine, aminovalerianic acid, alanine, phenylalanine, tyrosine, asparaginic acid, glutaminic acid, thymine, uracil, and lycine. For the separation of these bodies the methods of Fischer were employed.

F. P. Underhill.

The Cause of the Pharmacological Action of the Iodates, Bromates, Chlorates, Other Oxidizing Substances and Some Organic Drugs. By A. P. Mathews. *Am. J. Physiol*, 11, 237–250.—An explanation of exceptions noted in a former paper (*Am. J. Physiol.*, 10, 290), Abst. *this Review*, on the relation between physiological action and solution-tension.

F. P. Underhill.

The Influence of the Stromata and Liquid of Laked Corpuscles on the Production of Haemolysins and Agglutinins. BY G. N. STEWART. *Am. J. Physiol.*, 11, 250–282.—The conclusions noted in this article are: The stromata and haemoglobin-containing liquid of colored corpuscles, laked by various agents (water, freezing and thawing, and heat) cause, when injected into animals of a different species, the production of specific agglutinating and haemolytic substances. In general, the agglutinating effect is most marked after injection of stromata and the haemolytic effect after the injection of liquid. But the results do not warrant the conclusions that in the intact corpuscles the agglutininogen (the substance that causes the production of agglutinin) is all in the stroma and the haemolysinogen (the substance that causes the production of haemolysin) is all in the "cellular contents" (in Nolf's sense). Corpuscles fully fixed by formalin cause, on injection, the production of specific agglutinins, and to a smaller extent, of specific haemolysins. Such corpuscles are capable of being agglutinated by specific sera.

F. P. UNDERHILL.

The Action of Intravenous Injections of Glandular Extracts and Other Substances upon the Blood-Pressure. BY WALTER HAMBURGER. *Am. J. Physiol.*, 11, 282–303.—In a simultaneous intravenous injection of adrenaline and peptone, the adrenaline rise is present first, and is succeeded by the peptone fall of blood-pressure. This rise and fall always occur in a regular sequence, and may be detected, though the amount of either constituent be enormously in excess of the other. The adrenaline rise appears after a very short latent period, and is transitory. The peptone fall occurs more slowly, persists longer, and soon becomes permanent. Administration of peptone immediately after an adrenaline injection will in no way interfere with the extent or duration of the rise. On the contrary, the administration of adrenaline subsequent to a peptone injection will check the fall and produce a normal adrenaline rise. The intravenous injection of a saline extract of the hypophyseal (anterior) lobe of the pituitary body produces a distinct fall of blood-pressure. This fall is usually accompanied by an acceleration and weakening of the heart. A second injection of a saline extract of the hypophyseal lobe, immediately following the first, fails to produce any change in blood-pressure. If a considerable interval be allowed to elapse, a second injection will produce a fall. The active depressor substance is soluble in alcohol, glycerol, and salt solutions, but insoluble in ether. Repeated doses of the alcoholic extract, following each other immediately, are active. A secondary rise above the normal, follows the depressor effect produced by alcoholic extract of the hypophyseal lobe. It is also sometimes seen after injection of a saline extract. This may be due to an active depressor substance present in small amounts in the hypophyseal lobe or to the elimination of the "inhibitory" substance present in the saline extract. The experiments on the eyes of rabbits supports the view that adrenaline produces its constrictor effect by acting directly on the musculature of the vessel wall. Witte's peptone causes dilation of the vessels of the eye when applied directly, by acting on the vaso-motor nerve-endings alone. This effect is produced by an immediate action of some of its constituents, and not by a new substance formed under the influence of the body, as is the case with its effects on the coagulation of the blood. F. P. UNDERHILL.

On Pancreas Nucleoproteid. BY P. A. LEVENE AND L. B. STOOKEY. *Ztschr. physiol. Chem.*, 41, 404–406.—In this research the presence of uracil and thymin was demonstrated in pancreas nucleoproteid. F. P. UNDERHILL.

Methods for the Quantitative Chemical Analysis of the Brain and Cord. BY WALDEMAR KOCH. *Am. J. Physiol*, 11, 303–330.—For the methods outlined the original paper must be consulted. The chemical analysis of the white and gray matter of the brain of an epileptic gave the following figures.

Water.	White matter. Corpus collosum.		Gray matter. Cortex (prefrontal).	
Water	67.97		84.15	
Simple proteids	3.2	(by difference)	5.0	(by difference)
Nucleoproteid	3.7		3.0	
Neurokeratin	2.7	(Chittenden)	0.4	(Chittenden)
Extractives	1.51		1.58	
Inorganic salts	0.82		0.87	
Lecithins	5.19		3.14	
Kephalin and Myelin	3.49		0.74	
Amido lecithans	trace		trace	
Phrenosin and kerasin	4.57		1.55	
Cerebrin acids	trace		none	
Cholesterin	4.86		0.7	
Sulphur compound	1.40		1.45	
	99.41		102.58	

These analyses are given as being illustrative of the methods outlined, and must be regarded as merely preliminary results. The high result for the gray matter is probably due to the great difficulty in obtaining a uniform sample. F. P. UNDERHILL.

A Preliminary Study of the Digestibility of Connective Tissue Mucoids in Pepsin-Hydrochloric Acid. BY E. R. POSNER AND WILLIAM J. GIES. *Am. J. Physiol.*, 11, 330–350.—Connective tissue mucoids are digestible in pepsin-hydrochloric acid. The digestive process is relatively slow and gradual, and considerable substance remains insoluble even under the most favorable zymolitic conditions. In all the experiments the residue amounted to at least 10 per cent. of the original mucoid. The soluble products are albuminate, primary muco-proteoses (proto-, hetero- and dysproteoses), secondary mucoproteoses (deuteroproteoses A, B, and C) and mucopeptones (peptones A and B). The general properties of these bodies are identical with those of typical peptic products. The indigestible matter appears to consist mainly, if not wholly, of resistant compounds of proteid and glucothionic acid. In most cases the mucoproteoses were also found to be glucothionic acid products of varying composition. It is possible, however, that the customary methods used in the isolation of the proteoses are inadequate for separating any associated glucothionic acid. A glucothionic acid similar to chondroitin sulphuric acid was separated from both the indigestible matter and the proteoses. The peptones did not contain the glucothionic acid radical. At least 25 per cent. of the indigestible matter consisted of glucothionic action. Connective tissue mucoids are readily digested by trypsine in alkaline solution. Tryptophan, leucine and tyrosine are produced from them in abundance. F. P. UNDERHILL.

PHARMACEUTICAL CHEMISTRY.

Solution of Chlorinated Soda. BY H. V. ARNY AND J. F[illegible] WAGNER. *Am. J. Pharm.*, 76, 258.—Labarraque's solution made according to the pharmacopoeial method when assayed always [illegible] proved deficient in chlorine. To make 1000 grams of the solution 75 grams of chlorinated lime is used, which, if up to standard [illegible] should contain 26.25 grams of available chlorine. Of this amount [illegible] 26 grams of chlorine is supposed to be carried through the various operations and to be contained in the final solution. The authors show that it is impossible to manufacture the preparation with so small a loss. W. H. BLOME.

Progress in Pharmacy. BY M. I. WILBERT. *Am. J. Pharm.*, [illegible] 76, 286.—The physiological standardization of drugs, particularly [illegible] of digitalis, has recently been criticized, the criticism being based upon the assertion that frogs caught at different seasons of the year will give varying results. In order to obtain reliable results [illegible] such work should be carried on in summer, as frogs are then less variable.

Ipomoea Orizabensis, also known as "woody" or "male" jalap, is being offered on the market. As it is said to yield from 12 to 18 per cent. of resin while true scammony root yields but 5 or 6 per cent., the preference of manufacturers for the former becomes evident.

Messrs. Farr and Wright have found a mydriatic alkaloid in [illegible] *Lactuca Virosa*, thus confiming the researches of Dymond. The [illegible] same authors reporting upon "The Distribution of Alkaloids in [illegible]

Conium Maculatum" state that the development of the alkaloid is closely associated with that of the fruit and that the latter should be used in preference to any other part of the plant.

Fetron is the name of a new ointment base. It is a solution of stearic acid anilide in petrolatum and is said to combine many of the qualities of the latter and lanoline.

Dr. H. A. D. Jowett states that it is now generally accepted that the Epinephrin of Abel, Suprarenin of Fürth and the Adrenalin of Takamine, are more or less pure forms of the same substance. He agrees with Aldrich that it has the composition $C_9H_{13}NO_3$.

W. H. Blome.

Corean Ginseng. By Mrs. Bishop. *The Pharm. Era*, 31, 534.—Ginseng is used by the Chinese as a tonic, febrifuge and stomachic, and is looked upon by them as the very elixir of life. It is one of the most valuable of Corean exports. One steamer carried a consignment of the drug worth £140,000. The wild root is much more valuable than the cultivated; a single specimen of the former has been sold for £40. Ginseng is grown in beds 18 inches wide and 2 feet high. These beds are sown in April, the plants are transplanted during the following Spring and again in three years. The plant has two leaves when two years old, and after four years has attained the height of 6 inches. It reaches its maturity in six or seven years. The root when taken up is known as white ginseng, and when manufactured is known as red or commercial ginseng. It is steamed for about twenty-four hours, then partially dried in a drying chamber and finally completely dried by exposure to the bright winter sun.

W. H. Blome.

Notes on Manchurian Drugs. By A. Hosie. *Merck's Rep.*, 13, 164.—

Ginseng.—The statements made accord in the main with those in the above paragraph, except that the final methods of preparing the root differ. The latter are carefully washed, coated with syrup several times, and then dried in the sun.

Opium.—The opium poppy is cultivated throughout Manchuria. The poppy heads are incised horizontally, the sap being collected as soon as it exudes, and not left until the next morning as is customary in India and China. Local wants are supplied and large quantities exported.

Indigo.—The seeds are planted in rows by means of drills. The plants are cut off near the ground just before blossoming and steeped in large vats filled with water. The water acquires a green color, and after the plants are removed, is treated with lime, and this mixture beaten with a square piece of wood attached to a long handle, until the color changes to blue and the coloring matter separates completely. The supernatant water is removed, the sediment is collected and pressed into cakes as dry indigo or poured into waterproof baskets and sold as liquid indigo. W. H. Blome.

INDUSTRIAL CHEMISTRY.

On the Decomposition of Benzene at High Temperatures. By G. W. McKee. *J. Soc. Chem. Ind.*, April 20, 1904.—Experiments are described in which some light is thrown on the temperatures of the decomposition of benzene vapors when superheated.

The vaporized benzene is passed in a regulated stream through a thin-walled copper tube, coiled around a porcelain tube containing the thermo-couple of a Le Chatelier pyrometer. The coil and pyrometer are well insulated by a box of heavy asbestos boards. One end of the copper tube was cooled by a short glass condenser, fitted over it and the products so condensed were caught in a glass receiver.

The degree of decomposition of the benzene was determined by specific gravity determinations at 18° C. The following table shows the changes in gravity at different temperatures. The differences shown here in the third column, were represented in the original paper by a curve, which was seen to rise very sharply at about 700° C.

Specific gravity of benzene used	0.88181	Difference.
" " after heating to 448° C	0.88175	— 0.00006
" " " " " 550° C	0.88202	+ 0.00023
" " " " " 664° C	0.88362	+ 0.00160
" " " " " 720° C	0.88963	+ 0.00301
" " " " " 765° C	0.90276	+ 0.01313

The degree of decomposition was also noticed by evaporating a portion of the distillate to dryness and examining the residue with a polarizing microscope. Polarization colors denoting crystalline structure, were just visible at 550° C. and crystals easily distinguished at 562° C.

The author concludes by recommending that when benzene enrichers are added to a gas, such as water-gas, that the gas be not subjected to a temperature greater than about 700° C.

Samuel P. Sadtler.

Notes on the Fractional Condensation of Air, with a View to the Commercial Production of Oxygen. By Ernest A. Le Sueur, B.S. *J. Soc. Chem. Ind.*, April 15, 1904.—Dewar and Linde claimed that it was necessary to first condense air and then to distil it to get a mixture of nitrogen and oxygen, rich in oxygen. The author of the present paper claims that such a procedure is not necessary, but that on immersing air contained in a test-tube in a boiling mixture of oxygen and nitrogen, richer in oxygen than air, a blue liquid separates out which the author believes to be a mixture of oxygen and nitrogen, rich in oxygen. S. P. Sadtler.

The Improvement of Boiler-feed Water. BY A. MCGILL, M.A., F.R.S.C.—*J. Soc. Chem. Ind.*, April 15, 1904.—

Part I. Introductory.—The three respects in which natural waters may be objectionable for steam making are: (1) They may be corrosive; (2) they may foam or prime; (3) they may form scale.

There are few natural waters that are corrosive due to other constituents than air and carbon dioxide. To eliminate dissolved air, which acts with carbon dioxide on the iron of the boiler, Pfeifer recommends that the feed water be introduced near low-water level, so that the feed water may meet the hottest layers, and the air be immediately expelled with the steam.

Corrosion also occurs with acid waters, containing acid from mines, alum, etc., and from magnesium salts. In the case of magnesium chloride, the hydrochloric acid formed does not distil with the steam until a concentration of 1 per cent. is reached. The author states that corrosion may be prevented by the judicious use of soda, which, however, if added in excess, will cause foaming.

Foaming in natural waters is stated as due to increase of viscosity and decrease of surface tension as well as what Plateau calls "superficial viscosity."

The author proposes to set the following limits of causticity to waters treated with lime and soda.

Causticity due to	Limit.	Reasons.
Soda	10°	Economy of reagent and danger of saponifying fats.
Lime....	50°	Same reasons.
Baryta ..	0°	Same, with additional one of preventing poisonous water.

NOTE.—*Degrees of causticitv express the causticity, to phenolphthaleïn, of CaO per million parts.*

Part II. Methods of Analysis.—Very useful discussions of various analytical methods are given for determining the hardness, carbon dioxide, separations of lime and magnesia, and determinations of chlorides and sulphates. The author recommends in this section that a full analysis be made of a water supply when made for the first time. Simpler analytical determinations only being required thereafter for regulating the addition of chemicals for treatment.

Part III. Treatment.—Although the author mentions the use of a large number of substances, the use of quicklime, caustic soda and soda-ash are discussed at some length.

Lime is used to neutralize the half-bound carbon dioxide in bicarbonates (chiefly of lime and magnesia) and in some cases to precipitate magnesia from soluble salts as hydroxide.

Lime is also used with soda-ash to give the effect of caustic soda on soluble salts of lime and magnesia, but this action is never complete in the cold.

Soda-ash is used to precipitate soluble salts of lime and magnesia.

TABLE OF TREATMENTS.

	Reagents.				Hardness.			(Soda Na_2O).				
Sample.	Kind.	Quantity.	Causticity.	Alkalinity.	Temporary.	Permanent.	Total.	Original.	Added.	Total.	MgO.	Remarks.
I.	None	....	...	400	400	...	400	...	...	...	...	Calculated. Soft scale forming.
	CaO	4.0	5	31	31	...	31	...	...	...	...	Normal treatment. Free CO_2 removed. Water good.
	CaO	4.0	...	208	210	...	210	...	...	...	...	Free CO_2 not removed. Treatment unsatisfactory.
	CaO	4.4	16	31	22	...	22	...	...	...	...	Used 10 per cent. excess lime. Water too caustic.
	CaO	4.8	61	67	67	...	67	...	...	...	...	Used 20 per cent. excess lime. Water very caustic.
II.	None	....	...	396	396	...	396	...	...	...	194	Calculated. Soft scale forming.
	CaO	6.69	33	72	26	...	26	...	...	...	...	Very fair water. Will form a little soft scale.
	CaO	3.97	153	299	15	...	15	...	302	302	...	Treatment unsatisfactory and expensive. The water will foam.
	Na_2O	3.02	...	...	...	...	...	...	...	...	...	
III.	None	...	...	200	200	200	400	...	...	...	...	Calculated from known composition.
	None	...	...	175	175	212	388	...	...	...	...	Experimental numbers. Bad feed water.
	CaO	2.0	28	32	32	178	210	...	...	...	...	To eliminate temporary hardness only. Unsatisfactory.
	CaO	2.0	...	126	102	..	102	...	222	222	...	Fairly satisfactory.
	Na_2CO_3	3.8	...	...	...	...	...	...	...	...	...	
	BaO	5.47	...	48	48	14	61	...	...	...	1	
IV.	None	....	...	237	237	160	397	...	...	...	286	A very bad feed water. Calculated numbers.
	CaO	6.30	34	67	30	...	30	...	176	176	...	Satisfactory feed water.
	Na_2CO_3	3.01	...	...	...	...	...	...	...	...	...	Water is too caustic and will foam.
	CaO	2.34	146	246	9	...	9	...	436	436	...	Water much too caustic and will foam.
	Na_2CO	4.36	...	...	...	...	...	...	...	...	...	
	Na_2O	6.95	247	450	...	...	...	...	695	695	...	
VII.	None	....	...	178	178	224	402	240	...	240	160	Numbers calculated from known composition.
	None	....	...	179	193	202	394	240	...	240	162	Experimental numbers.
	CaO	4.02	72	132	45	...	45	240	249	489	...	Is satisfactorily softened, but will foam.
	Na_2CO_3	4.26	...	...	...	...	...	...	...	...	...	Very satisfactory treatment.
	BaO	6.12	50	166	45	...	45	240	...	240	...	
VIII.	None	....	...	394	178	224	400	240	...	240	160	Calculated from known composition.
	None	....	...	386	402	...	402	240	...	240	160	Experimental numbers. MgO shows up as carbonate.
	Boiled	10 min.	22	222	188	...	188	240	...	240	...	This water is only stable in the cold. Precipitates carbonates (chiefly $CaCO_3$) on boiling.
	CaO	4.00	163	372	62	...	62	240	249	489	...	Treatment unwarranted. Produces a foaming supply.

Caustic soda is the best precipitant for magnesia and for neutralizing half-bound carbon dioxide of bicarbonates, but lime is better for this latter purpose as it does not leave soluble salts in the solution. There are few cases in which caustic soda is preferable to quicklime.

If it were not for the expense, barium hydroxide would be the most useful substance for treatment. On account of its high combining weight at 3 cts. a pound it is three and one-half times as expensive as caustic soda at 4 cents. By its use hardness may be diminished without increasing the content of soda salts in the water.

Part IV. Experimental Investigation of Certain Problems of Water Treatment.—Very valuable information is contained under this head, but only a portion of the table in which the results are summarized are given on the preceding page.

S. P. SADTLER.

PATENTS.

JANUARY 5, 1904.

748,582. John H. Chapman, Cedar Rapids, Iowa. **Cob pipe filler.** Glucose, whiting, and coloring and water sufficient to make a stiff dough.

748,595. Neal Farnham, Chicago Ill. **Waterproofing brick walls, etc.** The wall is first heated with a blast-lamp or otherwise, then a waterproof coating of paraffin is applied, then a blast of sand and hot air is driven against it whereby the surplus material is cut off and the remainder hardened.

748,604. Jules E. Hesse and Mathias Paraf-Javal, Paris, France. Assignors to M. Jean Diederichs, Lyons, France. **Printing fabric.** The fabric is first coated with gum and a metallic tannate or tannic acid, then a design is printed on paper or similar base with a lake color, the design and the fabric are brought into contact, and the design transferred from the base to the fabric by heat and pressure.

748,609. Frederick F. Hurst, New Brighton, N. Y. Assignor two-thirds to Maas and Waldstein, New York, N. Y. **Electrolytic production of metallic oxides.** Tin oxide, for example, is obtained by forming both electrodes of tin and reversing the current so as to make each electrode alternately anode and cathode at suitable intervals, the electrolyte being a neutral alkali or alkaline earth.

748,668. Amedee M. G. Sebillot, Paris, France. Treating **copper ores.** Sulphuric acid is applied to unroasted ore at the boiling-point of the acid, the fumes are condensed and the sulphates formed are lixiviated in successively deeper baths with agitation, the liquid current and ore moving in opposite directions.

748,687. Frank H. Bates, San Francisco, Cal. Making **gas.** A body of oil is evaporated, the volume being maintained constant by fresh additions till the increasing residue makes poor gas, a second body is then treated in the same way, the heat being continued to the first body so long as gas is given off, the products being mixed, and when the evolution of gas ceases in the first, a new charge is supplied and the conditions reversed so that the process is continuous.

748,708. Henry V. Dunham, New York, N. Y. Assignor to Casein Co. of America. **Insoluble gelatine.** Gelatine 85, water 200, mix and add hexamethylene tetramine fifteen parts, dry and steam at 180° F.

748,709. **As above.** Casein is dissolved in glacial acetic acid equal parts, and the solution thickened with solution of nitrocellulose to a homogeneous celluloid.

748,711. Max Elb, Dresden, Germany. **Alimentary yeast extract.** Washed yeast is mixed with a large amount of water at from 60° to 70° C. filtered and condensed by evaporation to a paste.

748,739. Wilhelm Huffelmann, Duisberg, Germany. **Briquettes.** Fine or granulated ore is mixed with coke or charcoal of the same size of grain, the mixture is thoroughly dried and run into a mixing mill in which hot tar is sprayed by steam, enough to coat each particle and the whole molded under heavy pressure.

748,791. Friederich Rieche and Otto Saame, Oestrich, Germany. Assignors to Rudolph Koepp and Co., same place. Making **oxalates.** Formates are heated in presence of a small quantity of alkali not exceeding five per cent.

748,838. Herman E. Broestler, assignor to Eimer and Amend, all of New York, N. Y. **Hydrometer.** The lower bulb is adapted to contain the liquid whose specific gravity is to be determined, it is open at the lower end and is closed with a weighted stopper.

748,842. Joseph Cadotte, Suncook, N. H. **Case hardening compound.** White calcined plaster and prussiate of potash 40 parts each and lampblack 20 parts.

748,849-10. Robert K. Duncan, Washington, Pa. Assignor to Duncan Chemical Co., same place. **Ornamenting glass.** Lead oxide 111.5, and boric acid 31 parts are fused, molded and fused to the surface of the glass. Other proportions are given.

748,865. Edward R. Hewitt, Garden City, N. Y. **Clarifying liquors.** A base as an alkaline earth is added to the liquid, then an aqueous solution of sulphurous acid and calcium phosphate.

748,866. As above for making **glue.** Hides are soaked in a two per cent. solution of sulphurous acid containing calcium phosphate and calcium sulphite at less than 70° F., the hide is then dissolved and the solution neutralized by an alkaline earth, as BaO.

748,893-4. Edward N. Trump, Syracuse, N. Y. Apparatus and process for **drying soda,** etc. The material is driven upwards by a blast of air strong enough to hold it suspended, and to force the finished material onward, so as to separate it. A fan drives the air and material up through an inverted cone the top connected by a discharge pipe with a settling cylinder.

748,940. Frederick A. Feldkamp, Newark, N. J. Assignor to Electra Manufacturing Co., same place. Electrodes for **storage batteries.** A conducting plate is covered with a porous carbonized or parchmentized material as cotton cloth, particles of zinc are pressed into it and the whole is treated with a solution of a salt of lead.

748,943. Julius Gresley, Liesberg, Switzerland. **Hydraulic cement.** Mixtures of aluminum silicate and calcium carbonate are made in such proportions that the lime molecules are in excess of the sum of the acid molecules, a little sulphate is added and the whole burned below the sintering temperature.

748,968. Wm. B. Meixell and Thomas Holt, Sayre, Pa. Assignors to Samuel Thorp, Elmira, N. Y., and Harry L. Towner and Fred K. Stephens, Sayre, Pa. **Paper pulp** from printed paper. Old newspapers, etc., are reduced to a pulp, heated, and a mixture of soda 10, margaric 9, and oleic acid 59, water 21 parts and earthy matter 2 to 1 of the mixture is applied to the pulp to remove the ink, and the pulp is then treated as usual.

748,985. Johan J. Rink, Elsinore, Denmark. **Electrolytic apparatus** for decomposing alkali chlorides. A tank has a bottom with a raised center and compartments at either side, a horizontally moving mercury cathode passing along said bottom, combining cells without anodes terminating in one of said compartments, and decomposition cells terminating in the other compartment, said combining cells having twice the exposed area of the decomposition cells, and one series extending between the other.

749,004. Kikujiro Wadimori, Orange, N. J. **Finishing wood.** The surface is coated with dilute sulphuric acid, then heated to char it, and the charred wood brushed off.

749,078. Otto Meyer, Richmond, Va. Making **ether.** Carbohydrates are fermented, the wash distilled and the vapors brought directly in contact with sulphuric acid.

749,115. Benjamin Talbot, Leeds, England, and Paul Gredt, Luxembourg, Germany. Assignors to the continuous Metal Refining Co., Philadelphia. Making **steel,** etc. A charge is blown in a Bessemer converter, a part run off and more added, and the combined charge blown.

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749,195. Meinhard Hoffmann, Frankfort-on-Main, Germany. Assignor to Casella Color Co., New York, N. Y. **Blue wool dye.** A diazotized acetdiaminophenol sulphonic acid of the formula $C_6H_2OH(1)NH_2(2)NH.CO.CH_3(4)HSO_3(6)$ is combined with a hydroxylated naphthalene derivative, forming a dye easily soluble in water violet, turning scarlet by adding acetic acid, dyeing wool in acid bath dull claret turning blue on treatment with chromate.

749,224. Leonard M. Randolph, Newark, N. J. **Insulating compound.** Varnish residue and peat equal parts are heated together and molded. The "residue" is varnish gum and solvent oils.

749,276. Lucien Eilertsen, Paris, France. **Antiseptic dentures.** The plates are coated with a solution of non-vulcanized rubber containing an antiseptic as salol.

749,297. Eugen Jetter, Erfurt, Germany. **Artificial horn.** Raw hide is first saturated with glue and then with a solution of collodion in glacial acetic acid, then dried and saturated with aluminum chloride.

749,311. John A. Marsden, Lyon Falls, New York. Assignor to A. B. Paul, same place, and Andrew Tromblee, Carthage, N. Y. **Sulphur burner.** A rotary burner with conical ends, axial outflow and intake, the latter joined to a melting pot located in an oxidizing chamber.

749,322. Frederick B. Pope, Augusta, Ga. Assignor one-half to Magnus Swenson, Chicago, Ill., and Lamar L. Fleming, New York. Treating **oils.** Vegetable oils are heated on leaving the press, then treated with caustic soda 1 to 500 of oil and the precipitate is separated.

749,343. Max Vogtherr, Berlin, Germany. Testing **butter.** Measured volumes of molten butter and sulphuric acid containing 4 per cent. of amyl alcohol are mixed, shaken, allowed to settle and the upper layer of clear fat and the lower layer of sulphuric acid measured ; from the latter quantity deduct the sulphuric acid added which will give the water in the butter. These measures are obtained at once by a pipette suitably graduated.

749,350. Eugen Wuensche, Schonberg, near Berlin, Germany. **Printing plate.** A metal plate is washed with dilute nitric acid to free it from grease, then rubbed down and grained with pumice, coated with steatite, the design transferred to it, etched in, the acid neutralized by alkali, the plate washed, dried and rolled up with suitable ink.

749,418. Edward G. Acheson, Niagara Falls, N. Y. **Carbon compounds.** Masses of compound substances are arranged surrounded with a resistance material as powdered coke, whose specific resistance is greater than that of the masses themselves, and a current of electricity is then passed in a direction transverse to the direction of their greatest diameter, whereby the substances are polymerized. Applied to carbon articles for conversion into graphite.

749,420. Jesse D. Bourdeau, Battle Creek, Mich. Assignor to Bourdeau Food Co., same place. **Cereal malted food.** The grain is malted till the acrospires are one-half the length of the grain, which is then cooked, cooled, cured, flaked and baked.

749,450. Wilder W. Russell, Bayonne, N. J. **Wall wash.** Eight parts of glue are dissolved in 40 parts of water, 60 parts of oil and varnish each are mixed with 100 parts of whiting and terra alba each, and 200 parts of zinc oxide added, finally 32 parts of powdered pumice are added and the whole mixed to a uniform consistency. Parts by weight.

749,564. John W. Johnson and Lee Lock, Upper Sandusky, Ohio. **Rice food.** Rice is boiled, dried till the moisture is nearly removed, then swollen and parched by spreading it on a hot sand-covered surface till finished.

749,634. Bruno Seifert, Radebeul, Germany. **Acetyl-*p*-cresotinic acid.** Crystallizes from alcohol in white needles melting at 146° C., soluble in alcohol, acetone, ether and benzene. If free of *p*-cresotinic acid gives no blue color with ferric chloride, having an acid taste and giving *p*-cresotinic acid and acetic acid on treatment with boiling water.

749,643. George L. Teller, Chicago, Ill. **Baking-powder.** Casein 100 and hydrochloric acid 25 parts, forming a dry powder, are mixed with sodium bicarbonate, 3 or 4 parts to one.

749,684. Murray H. Chapin, Bridgeport, Conn. Assignor to Wyckoff, Seamans and Benedict, Ilion, N. Y. **Copying paper.** The leaves of a press copy-book are saturated with tannic acid, which acts as a mordant to set the aniline inks used in copying to render them insoluble.

749,700. Paul Naef, New York, N. Y. **Lixiviating ores.** The powdered ore is passed slowly downwards in a zigzag direction against a stream of leaching solution ascending in a serpentine route. Numerous jets of air or gas are passed through the mixed ore and solution whereby they are thoroughly mixed and agitated.

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749,728. John C. W. Greth, Pittsburg, Pa. Assignor to Wm.

B. Scaife and Sons, same place. **Water purifying.** Apparatus consisting of a water-distributing tank, a lime-slaking tank, a chemical tank and a floating tank all connected to the first tank to receive water therefrom, pipes for conveying the lime cream from the slaking tank to the solution tank and thence to the chemical tank, and a soda solution tank in which the floating tank sits, and a mixing tank for the lime and soda treated water and a settling tank connected therewith.

749,767-8. Edward F. Wilson, Chicago, Ill. Assignor to George B. Welles, same place. Process and apparatus for **carburetting air.** A hydrocarbon fluid and air are introduced into a sealed vessel at opposite ends and caused to travel through the vessel in a zigzag course being atomized during the passage, and such liquid as is condensed being collected, heated and reintroduced to pass upwards from the bottom of the vessel.

749,800. Charles Moureau, Paris; France. **Homologous propiolic acid.** An alkaline compound of the series C_8 or C_9 is treated with carbon dioxide forming a homologous propiolic acid of the acetylene family which is an oily liquid of specific gravity 0.964 to 0.967, boiling at 148° to 156° C. at 18 to 21 mm. pressure.

749,843. Henry R. Cassel, New York, N. Y. **Electrolysis of precious metals.** The pulp is circulated between vertical electrodes being lifted by jets of air which always throw mercury against the cathode towards which the rebounding mercury is also thrown, while the amalgam is removed, the alkali neutralized and the mercury returned to the cathode.

749,844. As above for the apparatus required.

749,853. James Estep, Tacoma, Wash. Assignor one-half to Robert L. Bloom, Lakeview, Wash. **Making butter.** One gallon of sweet cream is treated with one teaspoonful of a mixture, pepsin 1, alum 5, sugar of milk and saltpeter 6 each, the butter is churned, separated, salted and worked.

749,913. Oscar Bally, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. **Blueblack anthraquinone dye.** Its solution in water is red, becoming violet-blue on adding caustic soda; in concentrated sulphuric acid it dissolves red-violet turning dull blue on adding boric acid. Obtained by condensing purpurin with sulphanilic acid, and dyeing wool blue violet to blue-black.

749,925. John C. Fleming, New York, N. Y. **Refining oil.** A solution of borax and carbon dioxide is mixed with the oil which is atomized and subjected to a sucking and forcing action which thoroughly mixes the reagents, and the whole is then settled and filtered.

749,945. Paul Naef, New York, N. Y. Making **gas.** Illuating gas is distilled from fuel by a mixture of hot water-gas steam passed through it, the hot coke treated with steam water-gas and ammonia which are passed through the fuel and ed with the illuminating gas from the fuel, and the gas washed by-products and the coke delivered to the water-gas furnace.

49,980. Baptiste Balthazard, St. Fons, France. Assignor to iété Chimique des Usines du Rhone, same place. **Acetyl cylic acid.** Acetate of sodium and an ester of salicylic acid heated with p-toluene sulphochloride to make acetyl salicylic ester; if salicylic acid alone is used, acetyl salicylic acid re- s.

50,014. Thomas Baker, Melbourne, Victoria, Australia. Pre- ng **photographic prints** for toning. Sodium chloride 5, aluminum sulphate 20, are dissolved in 500 parts water, and prints treated therewith to convert the soluble silver salt to nsoluble one.

50,022. William S. Dempsey, New York, N. Y. **Metal- gical furnace.** A long horizontal furnace has a working and ımbustion chamber, blast-pipes above and below the grate, ıe above the grate being arranged to drive the gases towards working chamber, cross blasts on opposite sides, and a hot supply.

50,034. Wm. Jamisson and Francis J. Odling, Melbourne, :oria, Australia. **Separating zinc blende.** Wet pulverized is treated with chlorine to attack the surface thereof, the ore ıen vanned, whereby the particles of zinc blende agglomerate s to be easily separated by mechanical means from the rest of ore and gangue.

50,048. Hezekiah K. Brooks, Bellows Falls, Vt. Assignor :asein Co. of America, N. J. **Casein compound.** Equal ghts of ammonium persulphate and water are mixed and casein ed with agitation.

50,093-4-5-6. All to Alfred H. Cowles, Cleveland, Ohio. **etric furnace** and smelting process. A conical furnace filled ı a resistance conductor of varying cross-section, the density ıe electric current being inverse to the section so that the ·ge is uniformly heated, and means adjacent to the maximum ·ent density for drawing off the product *to wit*, calcium car- :. In 750,094, hot gases are passed through lime and carbon ·re smelting.

50,113. Arthur Luttringhaus, Ludwigshafen-on-Rhine. As- ıor to Badische Anilin und Soda Fabrik, same place. **Green** ı. Methylene violet 80, sodium tetrasulphide 240, carbon di- ıhide 120, and alcohol 1100 parts. The violet, sodium salt alcohol are heated till reaction is finished and then the carbon lphide is added.

750,155. Odin E. Boggs, Cincinnati, Ohio. Assignor to Automatic Humiditor Co., same place. Apparatus for **supplying moist air.** An air-pump drives air through a water tank to moisten it more or less as desired.

750,170-1. Alfred H. Cowles, Cleveland, Ohio. **Electric furnace** like 750,093, which see.

750,175. Henry Draney, Sudbury, Canada. **Explosive.** Nitroglycerin 75 and petroleum 25 parts by weight are mixed at 100° to 110° F. and 15 parts oil of mirbane added at the same temperature.

750,212. Charles Moureau, Paris, France. **Amyl propiolic ether**. An amorphous β-ketonic ether having the formula $RCO_2CH_2COCH_2CH_2CH_2CH_2CH_3$ (R being an alcohol radical), and being oily transparent liquids of agreeable odor and adapted for use as perfumes.

750,213. Charles Moureau, Paris, France. **Hexyl propiolic ether**. Oily colorless transparent liquids, of agreeable aroma, insoluble in water, easily soluble in alcohol, ether and benzene, and having the formula $RCO_2CH_2COCH_2CH_2CH_2CH_2CH_2CH_3$, R being an alcohol radical.

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MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

Mineral Resources and Mineral Industries of Oregon. By O. F. Stafford. *Univ. of Oregon Bull. No. 4*, Vol. I, viii+112 pp. ; map, plates.—The report contains information as to the occurrence, commercial or otherwise, of minerals of value throughout the State. Original chemical matter is almost wanting. It is of some interest to note, however, that as a result of work carried out under the author's direction, the wax-like substance found in the sands of Nehalem beach, in Tillamook County concerning the nature of which there has long existed a dispute locally, has now been settled in favor of the beeswax theory. It is certainly not ozokerite, as some have claimed. Its origin is still somewhat of a mystery. W. F. Hillebrand.

Luminescent Zinc Blende. By A. S. Eakle and W. J. Sharwood. *Eng. and Min. J.*, 77, 1000.—The writers have carefully examined a new find of sphalerite endowed with the rare quality of tribo-luminescence, that is, of phosphorescing when rubbed or scratched. It is from Mariposa County, California. The ore is a mixture of minerals, over half being barite and other insoluble matter, with about 35 per cent. of ferruginous sphalerite, besides subordinate galena and tetrahedrite. Gold, silver, cadmium and manganese, also, in one specimen, tellurium, were found in small amounts. It is very schistose in structure. It was reported to be highly uraniferous and radiferous, but neither uranium nor radium is present, and it is not capable of photographing itself. Tribo-luminescence has generally been regarded in sphalerite as exhibited only by light colored varieties, but this has the common brown color. The authors have seen luminescent light yellow blende from Eureka County, Nevada, and have heard of other occurrences, one each in Colorado, Arizona and Montana. W. F. Hillebrand.

Kunzite and Its Unique Properties. BY CHARLES BASKERVILLE AND GEORGE F. KUNZ. *Am. J. Sci.*, **18**, 25–28; figures.—The behavior of this remarkable mineral toward various forms of energy has been more fully investigated. Attrition does not produce luminescence, but a low degree of heat alone induces it to some extent. Rubbing with a woolen cloth produces electrification. When exposed to an oscillating current from large Helmholtz machines, crystals glowed most brilliantly an orange-pink, the effect persisting for forty-five minutes. Kunzite phosphoresces under the influence of ultraviolet rays, white crystals more than colored ones. Though opaque to the ray itself, all forms respond strongly to the Roentgen rays. In one of the latter cases an autophotograph "presented a very curious aspect not seen by the eye as of a misty or feathery outflow from the side or termination of the crystal, suggesting an actual picture of the invisible lines of force." Radium preparations excite wonderful and persistent phosphorescence. It is shown to be due to the gamma and not to the alpha rays. Actinium exerts effects similar to those of radium, and, like the latter, also upon diamonds and willemite. The small amount of manganese in kunzite is mentioned as barely possibly connected with its unique properties.
W. F. HILLEBRAND.

Analysis of Kunzite. BY R. O. E. DAVIS. *Am. J. Sci.*, **18**, 20.—SiO_2, 64.05; Al_2O_3, 27.30; NiO, 0.06; MnO, 0.11; ZnO, 0.44; CaO, 0.80; K_2O, 0.06; Na_2O, 0.30. Li_2O, 6.88; Ign., 0.15. Total, 100.15. No Mg, Cr, V, Ti, Fe, Sr, Ba, Th, Zr, or P. Spectroscopic test by Dr. W. J. Humphreys of the material which has been freed from silicon and lithium showed the absence of lines characteristic of the cerium and yttrium groups. This analysis agrees well with that of Schaller (This Journal **26**, R. 5) except that it shows nickel, zinc and calcium, which Schaller did not report. W. F. HILLEBRAND.

On the Occurrence of Celestite Near Syracuse, New York, and its Relation to the Vermicular Limestones of the Salina Epoch. BY EDWARD H. KRAUS. *Am. J. Sci.*, **18**, 30–39; figures.—The author has rediscovered the apparently forgotten source of celestite at Syracuse in the Salina limestone, throughout the body of which it is disseminated in a variety of ways. He is of the opinion that the cavities in the so-called Vermicular Limestone of the Salina Epoch were originally filled, not with salt, as has been suggested, but with celestite, this latter having been extracted by solutions carrying sodium, magnesium and calcium chlorides, in which strontium sulphate is markedly soluble. If so, the brines of the Syracuse region should contain strontium, and that this is so for the Tully brine at least, was proven by spectroscopic test. W. F. HILLEBRAND.

A New Type of Calcite from the Joplin Mining District. BY DOUGLAS B. STERRETT. *Am. J. Sci.*, **18**, 73–79; figures.—The crystals are nearly all large and were found in the Maybell mine at North Empire, Kansas. They are all twinned on the *e* face $(01\bar{1}2)$, showing an unusual uniformity of development, and they are characterized by a delicate amethystine or lilac color, resembling that of kunzite, which is confined chiefly to the outer parts of the crystals. W. F. HILLEBRAND.

Pseudomorphs and Crystal Cavities. BY J. P. ROWE. *Am. J. Sci.*, **18**, 80; figure.—Near Shoshone, Idaho, is a quartzite containing pyrite crystals, pseudomorphs of limonite after the pyrite, and finally the cavities left by solution of the limonite, all within a space of, sometimes, not more than five centimeters. The specimens are very fine and instructive, as showing how readily soluble limonite must be in the proper solutions, and how the cavities thus formed "might be refilled with quartz or calcite or some other mineral from solution and again give false forms, not true pseudomorphs as in the first instance, but so to all appearances." W. F. HILLEBRAND.

Description of the San Luis Quadrangle [California], 14 pp. BY H. W. FAIRBANKS. This descriptive text accompanying the *San Luis Folio No. 101 of the Geological Atlas of the United States*, issued by the Geological Survey, contains partial analyses of some of the igneous rocks of the region. These show a wide chemical range from highly silicious rhyolite to basic peridotite, and in texture they vary between glassy lavas and granites of deep-seated origin. In the section on economic geology it is stated that chrome iron occurs in large quantities and that its mining will no doubt be renewed at some time in the future. Only superficial explorations have thus far been made.
W. F. HILLEBRAND.

The Persimmon Creek Meteorite. BY WIRT TASSIN. *Proc. U. S. Nat. Mus.* **27**, 955–959; plates.—This granular octahedrite, containing numerous troilite and some silicate areas, is now in the U. S. National Museum, having been discovered in 1893. The locality of discovery is in Cherokee County, North Carolina. Its weight before cutting was 5.014 kilograms. The surface was deeply indented and much oxidized. Cut and polished surfaces show it to be an unusual type of siderite. The mass is composed of a more or less continuous matrix or iron-containing troilite, schreibersite and carbon. "Certain of the troilite areas contain carbon in such quantities that the bronze yellow of the containing troilite appears only as specks through the carbon." An olivine is found in these graphitic areas, as also sparingly in the nickel-iron. The less common schreibersite areas carry also carbon, but no olivine. The composition of the acid-soluble portion (obtained by several weeks' treatment with very dilute HCl, 1 : 25) is as follows: Fe, 94.36; Ni, 3.723; Co, 0.25; Cu, 0.29; Mn, 0.01; P, 0.27; SiO_2, 0.809; Al, Pt, MgO, traces. The Pt and Al may possibly have been admitted during analysis. The schreibersite, of 7.17 specific gravity, had the following composition: Fe, 69.33; Ni-Co, 17.26; P, 12.50. The nickel-iron alloy afforded: Fe, 85.00; Ni-Co, 14.50; P, 1.00. This gives approximately the formula Fe_6Ni. The olivine, of 3.39 specific gravity, yielded: SiO_2, 39.10; MgO, 48.20; FeO, 12.30. The methods of analysis employed, both chemical and mechanical, are given in part. It may be said that the succinate method for separation of iron from nickel and cobalt is given decided preference over the basic-acetate method in meteorite analysis.

W. F. HILLEBRAND..

The Superior Analyses of Igneous Rocks from Roth's Tabellen, 1869 to 1884, Arranged According to the Quantitative System of Classification. BY HENRY STEPHENS WASHINGTON. *U. S. Geol. Survey Professional Paper No. 28*, 68 pp.—The following remarks of Dr. Cross in his letter of transmittal sufficiently explain the character of this work, which fittingly supplements the more extensive publication by Dr. Washington already referred to in this Review (25, R. 442). "This compilation brings together all the quantitative analyses of igneous rocks made prior to 1884 that possess a sufficient degree of excellence to render them of value to the petrographer of the present day."

W. F. HILLEBRAND.

On the Paramorphic Alteration of Pyroxene to Compact Hornblende. BY C. H. GORDON. *Am. Geol.*, 34, 40–43.—The author presents the arguments for and against the derivation of compact hornblende from augite, and, without expressing an opinion as to their respective merits, urges caution in ascribing to it such an origin without conclusive proof. An observation of his own in the syenite gneiss of Canada appears to the author to afford irresistible proof that in this case actual alteration did take place.

W. F. HILLEBRAND.

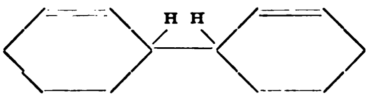
Contributions to Mineralogy. BY JOHN EYERMAN. *Am. Geol.*, 34, 43–48.—An igneous rock containing plagioclase, hornblende and pyroxene at Moore Station, New Jersey, south of Lambertville, on the Delaware River, affords several zeolites and a number of other minerals. Analyses are given of stilbite (4), natrolite and prehnite. From the Easton locality in Pennsylvania analyses have been made of orthoclase (2), tourmaline, biotite (3), altered prochlorite (2), actinolite, amphibole asbestos, and serpentine (3). The tourmaline analysis is as follows: SiO_2, 35.57; TiO_2, 0.18; B_2O_3, 10.10; Al_2O_3, 24.72; Fe_2O_3, 1.17; FeO, 9.40; CaO, 3.42; MgO, 8.29; Na_2O, 2.10; K_2O, 0.40; Li_2O, trace;

H_2O, 4.23; F, undetermined. Total, 99.58. Specific gravity, 2.991. Three analyses of garnets are given: French Creek, Pennsylvania; Franconia, Iron Mine near Sugar Hill P. O., New Hampshire; Bishop's Mill, Middletown, Delaware County, Pennsylvania. The last (almandite) contains nearly 9 per cent. of MnO. There is also an analysis on an unidentified zeolite (from French Creek?). W. F. HILLEBRAND.

The Dolomites of Eastern Iowa. BY NICHOLAS KNIGHT. *Am. Geologist*, **34**, 64–66.—From experiments made by Grace D. Bradshaw at Cornell College, Iowa, the author concludes that the silica in the above-named dolomites exists in the free state and not as a silicate, and the small amount of iron as ferric oxide and not as ferrous carbonate. The methods employed however, as to silica at least, do not prove the point, for it is not true that, as the author implies, evaporation to dryness with hydrochloric acid will in all cases decompose a silicate. There are, of course, very many which would be little if at all attacked.

W. F. HILLEBRAND.

ORGANIC CHEMISTRY.

On Triphenylmethyl (Eighth Paper). BY M. GOMBERG. *Ber. d. chem. Ges.* **37**, 1626–1644.—The action of metals upon triphenylmethane derivatives is similar to that upon triphenylchlormethane itself, and bodies may thus be prepared showing remarkable color reactions, and apparently belonging to the same class as triphenylmethyl. The colored solutions of these substances are immediately decolorized by the air, with formation of the peroxide of the triphenylmethane derivative just as with triphenylmethyl, the reactions being as follows: $RR'R''\,C.\,Cl + Me = (RR'R''C) + Me\,Cl$, and $2\,(RR'R''C) + O_2 = RR'R''C.\,O.\,O.\,CRR'R''$. Although these radicals were not separated in the pure state, the proof of their existence increases the number of triphenylmethyl analogues to ten, and proves that they are only individual representatives of a large class of such bodies. The para derivatives were first investigated, to determine in what measure the para position influenced the formation of these compounds. I. *Tolyl Derivatives.* — *Tri-p-tolylcarbinolchloride*, $(CH_3.C_6H_4)_3\,C.\,Cl$, prepared by the condensation of toluene and carbon tetrachloride, melts at 173°, and the corresponding carbinol at 94°. The same tri-*p*-tolylcarbinol was prepared by the Grignard synthesis from *p*-iodtoluene and *p*-toluic ester. By the action of silver (zinc could not be used) upon a solution of tritolylchlormethane in benzene (ether, ethyl acetate, etc.), in absence of air, the solution turns orange-red and a highly unsaturated body is formed. On long keeping, this solution loses its color and its affinity for oxygen, apparently because of polymerization to hexatolylethane. To prevent this polymerization as far as possible a current of air was drawn through the mixture of silver and carbinol chloride, to convert the unsaturated body into peroxide as fast as formed. The products of the reaction—peroxide, carbinol and hexatolylethane—can be separated by treatment with ether, in which the *peroxide* alone remains insoluble as a crystalline powder (yield, 20 to 40 per cent. of the theory). It crystallizes from benzene or ether in beautiful glistening crystals, m. p. 169°–170°, and can also be obtained by the action of sodium dioxide upon tritolylchlormethane. By warming the peroxide with a mixture of sulphuric and acetic acids (4 : 1) and pouring the solution upon ice, the carbinol is formed, while a carbon disulphide solution of the peroxide treated with dry hydrochloric acid gives tritolylchlormethane. *Di-p-tolylphenylcarbinolchloride.*—The carbinol was prepared by the Grignard reaction from *p*-bromtoluene and methyl benzoate, and then changed to the chloride by the action of dry hydrochloric acid. The carbinol melts at 79°-80°, the chloride at 106°-107°. By treating the chloride with silver and a current of air, an excellent yield of the *peroxide* is obtained (occasionally 70 to 80 per cent). It melts at 147°-148°. The same peroxide may be obtained from ditolylphenylchlormethane and sodium dioxide. Solutions of ditolylphenylmethyl are less red and more orange than those of tritolylmethyl. *Diphenyl-p-tolylcarbinolchloride* was prepared from benzophenone chloride and toluene by the Friedel and Crafts' reaction (yield, 70 to 90 per cent. of theory); also from *p*-iodtoluene and benzophenone, by the Grignard reaction, the carbinol thus formed being changed to the chloride by the action of hydrochloric acid. Treated with silver, an orange-yellow solution is obtained containing the unsaturated compound. Its *peroxide* melts at 170°-171°, and may also be prepared by treating a benzene solution of diphenyltolyl carbinol with sodium dioxide. *II. The Halogen Substituted Triphenylcarbinolchloride Derivatives.—p-Chlor-, p-Brom-, and p-Iodtriphenylcarbinolchloride.*—The condensation of benzophenonechloride with chlor-, brom-, or iodobenzene, works best at higher temperature and in absence of carbon disulphide. The chlorcarbinolchloride melts at 87°, the bromine compound at 111°, the iodine compound at 119°. The same chlorcarbinolchloride is obtained by condensing *p*-chlorbenzophenone chloride with benzenes. The halogen is, therefore, in the para position in the compound produced by condensing benzophenonechloride with chlor-, brom-, or iodobenzene. All three monohalogen triphenylcarbinolchlorides show the same behavior with metals as the tolyl compounds, giving strongly unsaturated bodies which form colored solutions, and which rapidly change to peroxides in the air. These peroxides can also be prepared by the action of sodium dioxide upon the carbinol chlorides. The melting-points of the peroxides are as follows: chlor-derivative, 165°; brom-derivative, 167°; iodo-derivative, 169°. *Tri-p-chlortriphenylcarbinolchloride* $(Cl.C_6H_4)_3CCl$ (with L. H. Cone), from chlorbenzene and carbon tetrachloride, is a beautiful crystalline substance, m. p. 146°–148°. Its *peroxide* forms a powder, m. p. 140°-142°. *III. Naphthalene Derivatives.—Diphenyl-α-naphthylcarbinolchloride*, from benzophenone chloride and naphthalene, forms snow-white crystals, m. p. 169°. Its *peroxide* is best prepared in warm ethyl acetate solution. *Trinaphthylcarbinolchloride* (?).—By the action of carbon tetrachloride upon naphthalene and treatment of the product with water, a substance, apparently trinaphthylcarbinol, was obtained. As its chloride could not be freed from color, the effect of silver upon it was not studied. *Tri-p-nitrotriphenylcarbinolchloride.* — Trinitrotriphenylmethane was oxidized to the carbinol, the melting-point of which was found to be 189°, instead of 171°-172° as stated by E. and O. Fischer. Phosphorus pentachloride must be used to convert this carbinol into its chloride as hydrochloric acid does not accomplish it. Its crystalline *peroxide* possesses all the properties of the trinitrotriphenylmethyl peroxide obtained by direct nitration of triphenyl peroxide. *V. Polymerization and Iodine Absorption.*—A series of sealed tubes was prepared containing solutions of the various unsaturated compounds referred to above. After a time, the color of some of these solutions had greatly faded, while some were entirely colorless. Such solutions when exposed to the air gave only traces of peroxides. These unsaturated substances absorb iodine eagerly, as is shown by the behavior of the solutions filtered from the silver. *VI. Constitution.*—As triphenylmethyl is dimolecular in solution, the simplest formula for it is that of Heintschel, $(C_6H_5)_2C$:  : $C(C_6H_5)_2$.

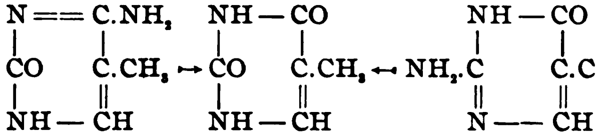
Such a formula for these compounds is in opposition to all their chemical properties and does not explain their remarkable reactivity. The author, therefore, prefers his formula of R_3C, and suggests that in solution two molecules of triphenylmethyl associate to the Heintschel formula. Whether the analogues of triphenylmethyl are dimolecular or not is still to be proved.

M. T. BOGERT.

On Triphenylmethyl. (Ninth Paper). BY M. GOMBERG AND L. H. CONE. *Ber. d. chem. Ges.*, 37, 2033–2051.—This paper deals with the preparation of triphenylmethyl in the pure state, its solubilities, melting-point, behavior when distilled under diminished pressure, molecular weight and electrical conductivity. This is followed by certain deductions concerning the constitution of triphenylmethyl. *I. Preparation.*—The action of zinc upon triphenylchlormethane, in dry benzene solution, was carried out in an atmosphere of carbon dioxide in a special apparatus (which is figured and described). The product thus obtained was further purified by dissolving it in warm chloroform, adding warm petroleum ether and cooling slowly. Triphenylmethyl is then separated in a crystalline nearly colorless condition. On standing, it gradually turns yellow. *II. Solubility.*—It is almost wholly insoluble in petroleum ether, monochloracetic ester and chlorcarbonic ester; very slightly soluble in chlorbenzene and benzylchloride, or in warm methyl or ethyl alcohols; moderately soluble in cold carbon tetrachloride or toluene, and noticeably soluble in warm. It dissolves quite well in ethyliodide or ethylene bromide, and with the greatest ease in chloroform and carbon disulphide, hot or cold. From toluene beautiful crystals may be obtained, but they contain toluene. *III. Melting-point.*—This was determined in an atmosphere of carbon dioxide, and found to be 145°–147°. The crystals obtained when the reaction was carried out in acetone solution melted at 144°–147°. The substance does not melt sharply, but darkens just before melting and then turns red on melting. *IV. Distillation.*—Attempts to purify triphenylmethyl by distillation under diminished pressure failed as it decomposed at the pressure used (19 mm). *V. Molecular Weight.*—The determinations were carried out in an atmosphere of nitrogen, with various solvents, the results showing clearly that triphenylmethyl in such solutions is dimolecular, *i. e.*, $[(C_6H_5)_3C]_2$, M. W. = 486, even at the moment of its formation from triphenylchlormethane and zinc. *VI. Conductivity.*—This was determined in liquid sulphur dioxide at 0°. The apparatus used is figured and described, data tabulated, and curves plotted. The conductivity, as usual, increases with the dilution, reaching its maximum at a dilution of over 1000 L. *VII. Conclusions.*—None of the formulas proposed for dimolecular triphenylmethyl are satisfactory. All the chemical reactions are best explained by the conception of the existence of individual triphenylmethyl, $(C_6H_5)_3C$, molecules. The authors, therefore, suggest that in solutions of triphenylmethyl we really are dealing with a condition of equilibrium between the dimolecular and the monomolecular forms, the latter being present in very small amount. All the reactions then are due to the presence of the monomolecular form, which as it is consumed in the reaction disturbs the equilibrium and more of the dimolecular form dissociates into the monomolecular, the reaction thus progressing to completion.

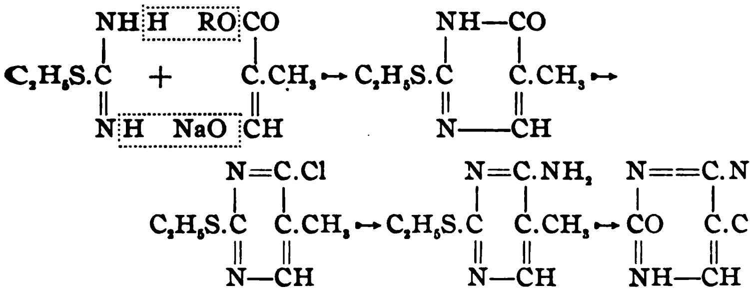
M. T. BOGERT.

Researches on Pyrimidine Derivatives: 5-Methylcytosine. BY HENRY L. WHEELER AND TREAT B. JOHNSON. *Am. Chem. J.*, **31**, 591–606.—It has been shown that cytosine gives uracil when heated with acids. Similarly, 5-methyluracil or thymine (*II*) should be obtained from 5-methylcytosine (*I*) or the isomeric 2-amino-5-methyl-6-oxypyrimidine (*III*):



(I) (II) (III)

The present paper deals only with 5-methylcytosine (I). Its isomer (III) will be discussed in a later paper. 5-Methylcytosine was prepared as follows: The ethyl bromide addition-product of thiourea was treated with 1 molecule of aqueous alkali and the sodium salt of ethylformylpropionate added. On standing, then warming for a few minutes, cooling and acidifying with acetic acid, 2-ethylmercapto-5-methyl-6-oxypyrimidine was obtained. This was changed to the chlor-compound by the action of phosphorus pentachloride, its Cl replaced by NH_3 by heating with strong alcoholic ammonia, and the mercapto group split off by boiling with halogen acid:



Experimental.—*2-Ethylmercapto-5-methyl-6-oxypyrimidine*, obtained as above described (yield, 26 to 28 per cent. of theory), crystallizes from water in long slender prisms, m. p. 158°–159°, very soluble in alcohol. *2-Ethylmercapto-5-methyl-6-chlorpyrimidine*, from the foregoing and phosphorus pentachloride (yield, 61.8 to 65 per cent. of theory), is a colorless nearly odorless oil, b. p. 146°-147° at 17 mm., 157°-159° at 25-26 mm. Heated with alcoholic ammonia, it gives *2-ethylmercapto-5-methyl-6-aminopyrimidine* (yield, 74 to 86.9 per cent. of theory), which crystallizes from 50 per cent. alcohol in colorless small stout six-sided tables and prisms, m. p. 96°–97°, very soluble in alcohol and quite difficultly soluble in water. *2-Ethylmercapto-6-chlorpyrimidine* boils at 135° at 24 mm. By passing ammonia into its boiling alcoholic solution, *2-ethylmercapto-6-ethoxypyrimidine* was obtained as an oil, b. p. 137°-138° at 18 mm., which when heated with alcoholic ammonia at 150°-175° remained unaltered, but when boiled with strong acid was converted quantitatively into uracil. *Cytosine Dihydrochloride*, $C_4H_5ON_3.2HCl$.—When 2-ethylmercapto-6-aminopyrimidine was warmed on the water-bath for three to four hours with concentrated hydrochloric acid and then cooled, beautiful stout brittle colorless flat prisms of this acid salt separated. *5-Methylcytosine Monohydrochloride (Anhydrous)*, $C_5H_7ON_3.HCl$.—When 2-ethylmercapto-5-methyl-6-aminopyrimidine was warmed with hydrochloric acid in the same manner as the above, the anhydrous 1 : 1 salt was obtained in colorless tables and flat prisms, melting with effervescence at 288°. When this salt was dissolved in water and an excess of ammonia added to the warm solution, microscopic colorless needles slowly separated, not very soluble in water, and probably $(C_5H_7ON_3)_5$ $2HCl.3H_2O$. Boiling the 1 : 1 salt with water, also gave a basic salt. *5-Methylcytosine*, separated from these salts, crystallizes from water in beautiful flat colorless prismatic brittle crystals, which give off half a molecule of water above 100°, and melt with effervescence at 270°. It is much more soluble in water than cytosine, thymine or uracil, and is readily decomposed into thymine by 20 per cent. sulphuric acid at 150°. One of its most characteristic properties is its tendency to form basic 2 : 1 salts with hydrochloric and hydrobromic acids. It is precipitated by phosphotungstic acid. *5-Methylcytosine Monohydrochloride (Hydrous)*, $C_5H_7ON3.HCl.2H_2O$.—An attempt to prepare a dihydrochloride by dissolving the above 1 : 1 salt in water and saturating with hydrochloric acid was made. The solution, on evaporating spontaneously in a desiccator over sulphuric acid, deposited small, stout, transparent prisms or rhombohedrons, of the hydrated 1 : 1 salt. *5-Methylcytosine Basic Hydrochloride*, $(C_5H_7ON_3)_2HCl.H_2O$, crystallizes from water in small needles or prisms. The corresponding *basic hydrobromide* was also prepared. Heated for three hours at 150°-160° with 20 per cent. sulphuric acid, 40 per cent. of it was hydrolyzed to thymine. *Acetyl-5-methylcytosine*, from the base and acetic anhydride, crystallizes from water in needles, not melting below 290°. *5-Methylcytosine Picrate* crystallizes from water in long slender bright-yellow needle-like prisms, decomposing at 286°. The *chloroplatinate* is quite soluble in water. The aqueous solution, on standing in a desiccator, deposits small orange rosettes. *2-Ethylmercapto-5-brom-6-oxypyrimidine*, from 2-ethylmercapto-6-oxypyrimidine and bromine in glacial acetic solution (yield, 89 to 91.7 per cent. of theory), crystallizes from alcohol in beautiful colorless needle-like prisms, m. p. 189°. Boiled with hydrochloric acid, it yields 5-bromuracil; heated with aqueous ammonia at 180°, it gives 5-aminouracil. *2-Ethylmercapto-5-brom-6-chlorpyrimidine*, from the foregoing and phosphorus pentachloride (yield, 92 per cent. of theory), forms soft talc-like colorless plates, melting at about 27°. Heated with alcoholic ammonia at

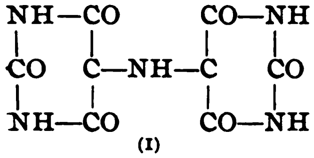
160°, it is changed to *2-ethylmercapto-5-brom-6-aminopyrimidine* (yield, 89.7 per cent. of theory), which crystallizes from alcohol in beautiful colorless prisms, m. p. 123°-124°. Boiled with concentrated hydrochloric acid, this latter compound is converted into *5-bromcytosine* (yield, 77.3 per cent. of theory), crystallizing in needle-like prisms, which decompose rapidly above 235°. *Nitrocytosine*, $\overline{\mathrm{CH:CH.NH.CO.N:C}}\mathrm{.NH.NO_2}$, prepared by direct nitration of cytosine (yield, 64 per cent. of theory), crystallizes from water in minute colorless needles, very difficulty soluble in water, but readily soluble in strong ammonia. It decomposes rapidly above 300°. As it could not be reduced without decomposition, it is believed to possess the nitramide structure.

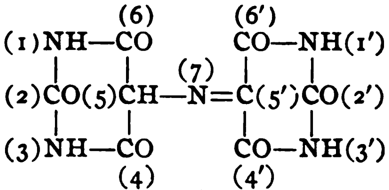
M. T. BOGERT.

The Reaction between Unsaturated Compounds and Organic Magnesium Compounds. I. Reaction of Unsaturated Aldehydes and Unsaturated Ketones. BY E. P. KOHLER. *Am. Chem. J.*, 31, 642–661.—The compound obtained by the interaction of phenylmagnesiumbromide and benzalacetophenone, and previously (*Am. Chem. J.*, 29, 352) described as "diphenylstyrylcarbinol," $C_6H_5.CH:CH.C(OH)(C_6H_5)_2$, is now found to be not a tertiary alcohol at all, but the isomeric β,β-diphenylpropiophenone, $C_6H_5.CO.CH_2.CH_2(C_6H_5)_2$. This, therefore, represents a new kind of reaction of organic magnesium compounds, the phenylmagnesiumbromide not combining in this case with the CO group, as it does with saturated ketones, but with the unsaturated carbons of the chain, giving either Formula *I* or *II*: $(C_6H_5)_2CH.CH.(MgBr)COC_6H_5$ (*I*), or $(C_6H_5)_2CH.CH:C(OMgBr)C_6H_5$ (*II*). The author prefers Formula (*II*). A number of experiments were made to ascertain to what extent α,β-unsaturated compounds combine with organic magnesium compounds in the manner just described for benzalacetophenone. The results indicate that the reaction is independent of the nature of the magnesium compound and is determined entirely by the character of the unsaturated compound used. The results obtained with a selected list of typical unsaturated compounds are tabulated. EXPERIMENTAL.—The general method of procedure was as follows: An ether solution of the ketone was added, drop by drop, to a similar solution of the magnesium compound at —10°, until a permanent precipitate was obtained. The vessel was then removed from the freezing-mixture, left several hours at room temperature, decomposed with ice, the magnesium salts dissolved in iced hydrochloric acid, the organic product collected with ether, and purified by recrystallization from alcohol. *I. Reactions with Benzalacetophenone.* — *Diphenylpropiophenone*, $(C_6H_5)_2CHCH_2COC_6H_5$, can also be prepared by the direct, condensation of benzalacetophenone and benzene. It is not obtained, however, from diphenylpropionyl chloride, benzene and aluminum chloride, the product being ketophenyldihydroindene, $C_6H_5.\overline{CH.CH_2.CO.C}_6H_4$. The *phenylhydrazone* of diphenylpropiophenone crystallizes from alcohol in pale yellow needles, m. p. 137°. *Oxime;* large lustrous needles, m. p. 131°. By a "Beckmann rearrangement" of this oxime, *diphenylpropionanilide* was obtained, crystallizing from aqueous alcohol in needles, m. p. 167°, and yielding β,β-diphenylpropionic acid on hydrolysis. *Diphenylethyldiphenylcarbinol,* $(C_6H_5)_2CHCH_2C(OH)(C_6H_5)_2$, may be obtained from diphenylpropiophenone and phenylmagnesiumbromide, or from the methyl ester of diphenylpropionic acid and phenylmagnesiumbromide. It cannot, however, be prepared direct from benzalacetophenone and excess of phenylmagnesiumbromide. It crystallizes in needles, m. p. 95°-96°. *Bromdiphenylpropiophenone,* $(C_6H_5)_2CHCHBrCOC_6H_5$, is easily formed by the action of bromine upon the magnesium compound obtained from benzalacetophenone and phenylmagnesiumbromide (yield, 98 per cent. of theory). It melts at 173°. *Benzoyltriphenylpropenol,* $(C_6H_5)_2CHCH:C(C_6H_5)OCOC_6H_5$. The magnesium compound formed in the reaction between benzalacetophenone and phenylmagnesiumbromide reacts with benzoyl chloride in the cold to give this derivative. It forms long transparent needles, m. p. 220°. *Phenylbutyrophenone,* $C_6H_5(CH_3)CHCH_2COC_6H_5$, from benzalacetophenone and methylmagnesiumiodide, crystallizes from alcohol in large colorless plates, m. p. 74°. Its *oxime* crystallizes from aqueous alcohol in needles, m. p. 93°. *II. Reactions with Benzalpropiophenone.*—Benzaldehyde and propiophenone, condensed by means of hydrochloric acid gas, gave *benzylchlorpropiophenone,* $C_6H_5CHClCH(CH)_3COC_6H_5$, m. p. 83°. Distilled under diminished pressure, this lost HCl and gave pure benzalpropiophenone, b. p. 190°-192° at 20 mm. Its *phenylhydrazone* crystallizes from alcohol in lemon-yellow needles, m. p. 131°. *Diphenylisobutyrophenone,* $(C_6H_5)_2CHCH(CH_3)COC_6H_5$, from benzalpropiophenone and phenylmagnesiumbromide (yield, 96 per cent. of theory), crystallizes from alcohol in needles, from ligroin in large transparent plates, m. p. 105°. Its oxime crystallizes from weak alcohol in needles, m. p. 145°. *III. Reaction with Dypnone.*—Dypnone was prepared by dissolving acetophenone in glacial acetic acid and saturating the solution with hydrochloric acid; after standing twenty-four hours, the mixture was fractionally distilled under a pressure of 28 mm. *β,β-Diphenylbutyrophenone,* $(C_6H_5)_2(CH_3)C.CH_2COC_6H_5$, from dypnone and phenylmagnesiumbromide, crystallizes in thick prisms or tables, m. p. 103°. Its *oxime* crystallizes in needles, m. p. 163°. *IV. Reaction with Benzalacetone.*—The only product obtained from the interaction of benzalacetone and phenylmagnesiumbromide was an oil, whose behavior on oxidation indicated that it was the tertiary alcohol, $C_6H_5CH : CH.C(OH)(CH_3)C_6H_5$. *V. Reaction with Cinnamic Aldehyde and α-Bromcinnamic Aldehyde.*—Judging by the behavior on oxidation, the product obtained from cinnamic aldehyde and phenylmagnesiumbromide contained only the secondary alcohol, $C_6H_5CH : CH.CH(OH)C_6H_5$. A similar result was obtained with α-bromcinnamic aldehyde and phenylmagnesiumbromide.

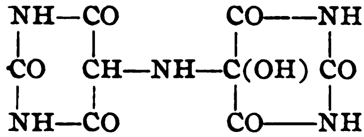
M. T. BOGERT.

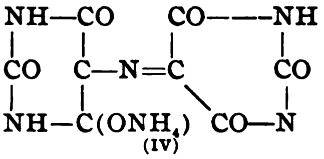
The Constitution of Purpuric Acid and of Murexide. BY MAX SLIMMER AND JULIUS STIEGLITZ. *Am. Chem. J.*, 31, 661–679.—It is shown that Beilstein's formula (I) for purpuric acid is wrong, and new formulas for the acid (II) and for its hydrated form (III) are proposed:

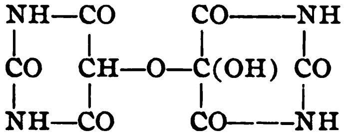

(I)



(II)


(III)


(IV)


(V)

The formation of purpuric acid from uramil and alloxan is, therefore, a simple "ketone ammonia" condensation giving formula (III), which readily loses water and passes into formula (II). In murexide (ammonium purpurate) and the other salts of purpuric acid, the metal is believed to be in union with oxygen, as shown in formula (IV). There is a marked tendency for the condensation between uramil and alloxan to stop at the intermediate stage (III), and freshly precipitated murexide contains a molecule of water which is not water of crystallization, for 7-alkyl uramils condensed with alloxan in presence of ammonia give highly-colored salts resembling the purpurates, and which cannot lose the molecule of water in question. The proof that formula (II) is the correct one for purpuric acid, and that formula (I) is wrong, is based upon the following facts: 1. Formula (I) represents a symmetrical molecule, while experiments prove purpuric acid to possess an asymmetric molecule. 2. According to formula (I) a free hydrogen is necessary upon carbon No. 5, to secure the condensation between uramils and alloxans. Experiments disprove this also. 3. The purpurate obtained from 7-methyluramil and alloxan in ammonia solution has the composition $C_9H_{12}O_7N_6$ even when dried at 100°, as required by formula (III). The authors suspect that the change of structure from the pseudoform (II, or III) to that of the salts (IV), may have an important connection with the question of color in this group. Formula (V) is suggested for the constitution of alloxantin. EXPERIMENTAL.—*The Asymmetry of the Purpuric Acid Molecule.* By condensing 1,3-dimethyluramil with alloxan, in presence of ammonia, ammonium 1,3-dimethylpurpurate was obtained, while the condensation of uramil with 1,3-dimethylalloxan gave the 1′,3′-dimethylpurpurate. The two products are not identical. *Ammonium 1,3-dimethylpurpurate* crystallizes in small four-sided prisms, quite similar to murexide except for being slightly yellower in luster. Decomposed with hydrochloric acid it yielded dimethyluramil, the filtrate and washings from which when treated with hydrogen sulphide gave alloxantin ammonium *1′,3′-dimethylpurpurate* is very similar to its isomer in solubility and general appearance, but when decomposed by acid gives dialuramide, while the action of hydrogen sulphide upon the mother-liquor yields tetramethylalloxantin (amilinic acid). *The condensation of 5-amido-4-methyluracil with alloxan yielded 4-methyluracilimidoalloxan,*

$$CO.NH.CO.NH.C(CH_3):C.N:C.CO.NH.CO.NH.CO,$$

as a heavy dark red precipitate. Such a condensation is opposed to the Beilstein formula (I). *The Action of Ammonia and Primary Amines on Alloxantin and the Significance of the Water of Crystallization in the Salts of Purpuric Acid.*—By heating alloxantin for ten hours at 100° with alcoholic ammonia. it is completely converted into anhydrous murexide. Alloxantin, being the dialuric ester of alloxan, is first split by the ammonia into uramil and alloxan, which then unite, in presence of a second molecule of ammonia, to murexide. Purpurates, when freshly prepared, contain one molecule of water which they lose at ordinary temperature. This is water of constitution, and has the same significance as the water in chloralhydroxylamine. The 7-alkylpurpurates, on the other hand, cannot lose water in this way. *Ammonium 7-Methylpurpurate Hydrate,*

$$CONHCONHC(ONH_4):C.N(CH_3).C(OH).CONHCONHCO,$$

was prepared by the condensation of 7-methyluramil and alloxan in presence of ammonia, by the oxidation of 7-methyluramil with ercuric oxide, and also by the action of methylamine on lloxantin at 100°. The compound crystallizes in small four-ided prisms, very similar to the ordinary murexide. *Ammonium -Ethylpurpurate Hydrate.* From alloxantin and ethylamine, 7-thyluramil was prepared. This was converted into the correponding ammonium purpurate by the action of alloxan and amionium carbonate. It resembles the other purpurates very losely. *The Position of the Metal in the Salts of Purpuric Acid.*—Irea was dissolved in hot alcoholic sodium ethylate, malonic ster then added and the mixture heated for seven hours at 100°. n this way, a yield of 94-97 per cent. of barbituric acid was btained. The barbituric acid was converted into potassium iolurate by the action of potassium nitrite and acetic acid, nd the violurate reduced to uramil by hydriodic acid and phoshonium iodide. By this method, 70 per cent. of the malonic ster was converted into uramil. This was changed into otassium purpurate by dissolving in caustic potash and addig alloxan. *5-Methylpurpuric Acid.*—The above potassium pururate was dried at 100°, and methylated with methyl iodide, iving the 5-methylpurpuric acid. *O-4-Methylpurpurate,* from ilver purpurate and methyl iodide, gives off methyl chloride hen heated in a current of dry hydrochloric acid gas. The ubstance is deep-red in color, but when dissolved in hot water s rapidly hydrolyzed, forming a colorless solution.

M. T. Bogert.

BIOLOGICAL CHEMISTRY.

The Hourly Variations in the Quantity of Haemoglobin, and the Number of the Corpuscles in Human Blood. By Herert C. Ward. *Am. J. Physiol.*, 11, 394-404.—These experiients were carried out upon four healthy men living under unirm conditions. The counts were made hourly, extending over period of nine days. The red corpuscles were counted with a homa-Zeiss instrument and for each count 1000-2000 cells were tually counted. Fleischel's instrument was employed for the stimation of haemoglobin. In the differential work Jenner's ain was used and each percentage is based upon a count of from 00 to 2500 cells. By these methods it was found that in the orning there are 4,900,000 red corpuscles per cubic millimeter. his number gradually decreases until about five o'clock in the fternoon when the minimum number is reached, being about 659,000. From this time until three o'clock in the morning here is a steady rise when the maximum number of the day is eached, 5,000,000 per cubic millimeter of blood. The haemolobin follows the curve of the erythrocytes step by step. Early n the morning there is 88 per cent., in the afternoon 83 per cent.

The leucocytes are lowest in the morning, the number 8,500 to 10,000 being the maximum, which occurs about five o'clock in the afternoon, after which there is a steady fall.

F. P. UNDERHILL.

On the Relation of Autolysis to Proteid Metabolism. BY H. GIDEON WELLS. *Am. J. Physiol.*, 11, 351-354.—Since autolysis is probably a function of all cells, and as proteolysis may be involved it has been assumed that the autolytic ferments are important factors in the proteid metabolism of the cells. The recent work of Cohnheim and others on the interaction of enzymes has suggested to the author to determine whether substances known to have a modifying action upon proteid metabolism have also an influence upon cell autolysis. The thyroid influences nitrogenous metabolism markedly, for, if the gland become diseased or is removed, nitrogenous metabolism is much reduced, and evidences of cell activity are correspondingly diminished. Under these conditions if active preparations of the gland be fed, nitrogenous metabolism is increased. Effects directly opposed to these are observed when the kidney is studied in this connection. Wells has attempted to see if these effects could be attributed to an action of some constituent of the thyroid and kidney upon the autolytic ferments of the body. Livers of dogs were ground to a paste and 5 grams employed in each experiment. Extracts were made of thyroid, kidney, spleen, and liver by grinding these organs to a paste and extracting with N/8 salt solution and straining through fine sieves. The extract was added to the liver in quantities representing 5 grams of the original tissue. To this mixture contained in a small Erlenmeyer flask were added 100 cc. of water or salt solution, and 10 cc. of toluene. The flasks were tightly stoppered and placed in an incubator for one to three weeks, being shaken daily. The mixtures were then heated to 100° C., filtered, and analyzed for the different kinds of nitrogen existing in the filtrate. Estimations were made for nitrogen existing in a coagulable form, nitrogen in a non-coagulable form, but precipitable by zinc sulphate in an acid solution, and nitrogen not thrown down in either way. The results of the analyses warrant the conclusion that under the conditions here employed it cannot be shown that extracts of thyroid, kidney, and spleen have any decided effect upon the autolysis of the liver of the dog. F. P. UNDERHILL.

Do the Mucoids Combine with Other Proteids? BY E. R. POSNER AND WILLIAM J. GIES. *Am. J. Physiol.*, 11, 404–437. —If a neutral gelatine or proteid solution be treated with a faintly acid, opalescent mucoid solution, a bulky flocculent precipitate will be thrown down on the instant of contact. The same or any other amount of acid alone will have no perceptible effect on the tine, and the neutral or alkaline mucoid solution. The ;ht of the precipitate formed in this way exceeds that of the oid. For the experiments given here tendomucoid from the illes tendon of the ox, prepared according to the method of er and Gies (*Am. J. Physiol.*, 3, p. VI and 1901, 6, p. 155), employed. As a rule, varying quantities of 0.2 per cent. :ochloric acid were added to alkaline solutions of the mucoids alkali being used in the preparation of the mucoid.) This tion of the mucoids was tried with the following preparations: .tine, proteoses, alkali albuminate, acid albumin, the proteids ie aqueous extract of muscle and tendon, blood serum, and e of egg. The authors show that the mucoids contain gluionic acid radicals, and offer the suggestion that there are ably side-chains to which proteids may be united. The mu-s may be likened to unsaturated compounds and the amount roteid that will unite with them may be very variable. When e facts are taken into consideration it is obvious why the yses of mucoids have not given concordant figures.

F. P. UNDERHILL.

1e Inhibitory Influence of Potassium Chloride on the rt, and the Effect of Variations in the Temperature upon ; Inhibition and the Vagus Inhibition. BY E. G. MARTIN. *J. Physiol.*, 11, 370-394.—The object of this research was to y analogies existing between potassium and vagus inhibition ·der to determine if possible how much probability there may ı the suggestion that they are identical. The method in ral was to perfuse the heart of the terrapin with Ringer's so-n in which the potassium chloride was made to vary, care be-taken to keep the solution nearly isotonic with terrapin n, and the proportion of sodium was correspondingly de-sed. The influence of temperature changes was also observed. eriments made upon the vagus in this connection show that : is some ground for the suggestion that the two kinds of ɔition may be identical. F. P. UNDERHILL.

1e Chemistry of Bacillus Coli Communis. BY MARY F. CH. *J. Am. Med. Assoc.*, April 16, 1904.—Pure colon ɪres obtained from feces were grown on 2 per cent. agar, large tank. After seven to fourteen days the growth was ɔved, freed from agar, extracted first with alcohol and then . ether, dried and pulverized. This material was heated with r cent. sulphuric acid and filtered. The extract was poured alcohol, and then purified by solution in alcohol. After .ng at 100° for long periods, a dry powder is obtained which ery hygroscopic. Determinations on the ash show that 5.3 cent. of the substance is phosphorus. Sulphur is present to extent of 9.22 per cent. Nitrogen determinations by the

Kjeldahl method give 6.49 per cent. This acid cleavage product dissolves in water, giving an opalescent solution, and is acid to litmus. The solution becomes clear and transparent on the addition af a trace of alkali. It gives a very faint biuret test, possibly due to a trace of proteid carried down with the precipitate. Nitric acid gives a good xanthoproteic reaction. In this article the presence of the hexone bases (histidine, arginine, lysine) in bacterial cells has been indicated. The methods employed were those of Kossel and Kutscher (*Ztschr. physiol. Chem.*, **31**, 165, (1900)) with some modifications. A similarity between bacterial and other proteids is thus suggested by these results.

F. P. UNDERHILL.

The Utilization of Vegetable Proteid by the Animal Organism. BY ELBERT W. ROCKWOOD. *Am. J. Physiol.*, **11**, 355–370.—These experiments were carried out with both pure and impure preparations of vegetable proteids in order to obtain further information regarding the utilization of these vegetable proteids, and the conditions that influence their utilization. The degree of utilization is assumed to be indicated by the difference between the nitrogen of the food and that of the feces. Experiments were also carried out to determine how the utilization of these proteids is influenced by cooking. The experiments were made upon the dog and man. The most important conclusion to be noted from this research is that if the vegetable proteids are eaten without being removed from the materials associated with them, they are not so well utilized as proteids of animal origin. The utilization is somewhat better although only slightly increased by long cooking. The following table shows the percentages of food nitrogen excreted in the feces.

Vegetable proteid.	Duration of cooking.	Nitrogen in feces. Per cent.
Meat diet (4 experiments)......	Uncooked	5.1–6.6
Norka (malted oats)...........	"	8.8
Coarse oatmeal	5–8 minutes	19.7
" "	"	15.4
Rolled oats....................	"	13.8
Oat proteid....................	"	4.4
" "	"	10.5
Zein	"	22.4
"	"	10.5
Fine oatmeal..................	4-6 hours	15.8
" "	"	14.4

F. P. UNDERHILL.

On the Self-digestion of Nucleoproteids. BY WALTER JONES. *Ztschr. physiol. Chem.*, **42**, 35–55.—The self-digestion of the nucleoproteid of the thymus gland yields xanthine, a small quantity of the hypoxanthine, and uracil, but neither guanine, adenine, nor thymine appear, although the last three are formed by the action of mineral acids upon the thymus nucleic acid.

Xanthine and a small quantity of hypoxanthine are formed as a result of the self-digestion of the suprarenal gland ; by the hydrolysis of these glands with boiling acids guanine and adenine result. In this case of autolysis leucine is not formed in any appreciable quantity although there is available an excess of leucine-forming material. The spleen when subjected to autolysis yields quanine just as well as in the hydrolysis of the nucleic acid. On the other hand, hypoxanthine is found in the autolysis while one might expect to find adenine; uracil is formed instead of thymine and cytosine, which are formed in the hydrolysis of nucleic acid. The results of these experiments speak against the view that different hydrolytic agents attack the molecule on different sides and hence the formation of such different products. For the methods of experimentation employed the original article must be consulted. F. P. UNDERHILL.

INDUSTRIAL CHEMISTRY.

The Continuous Advance of Electrochemistry. BY JOSEPH W. RICHARDS, PH.D. *Trans. Amer. Electrochem. Soc., Vol. V.*—The field of electrochemistry is divided into three distinct lines of endeavor—1st, the investigation and classification of electrochemical phenomena—scientific progress; 2nd, the formulation of a satisfactory and all-comprehensive electrochemical theory—intellectual progress; and 3rd, the application of these facts to industrial ends—industrial progress. *I. Investigation and Classification of Electrochemical Phenomena.*—The work of collating the literature is being laboriously carried out in Germany in the "Ausführliches Handbuch" and Dr. Richards calls attention to the many gaps that show themselves in this field of research. Among the workers, both past and present, have been Davy and Faraday who "laid broad the experimental foundations of this science by the electrolytic decomposition of many of our most common chemical compounds." Bunsen worked upon the rarer metals, Kohlrausch, specific conductivities ; Beetz and Lorenz, fused salts ; Moissan, high temperature work; Hittorf, Ostwald and Nernst, the mechanism of electrolysis of solutions; Faure, the calorimetric investigation of electrolytic cells in operation; A. A. Noyes and L. Kahlenberg have made departures, in their work on the electric conductivity of solutions at high temperatures and non-aqueous solutions, respectively. *II. The Building of a Comprehensive Electrochemical Theory.*—With reference to the theory of electrolytic dissociation being the true explanation of the nature of a solution, Dr. Richards says "it is not certainly true" and believes personally that in solutions the solute is in an abnormal physical state, having a resemblance to the gaseous state and that in some cases a definite compound of the solute with the solvent exists in the solution, it being in an abnormal physical state but not abnormal chemically. The author believes the theory is not likely to be proven false but may gradually die as something else explains the facts better. Researches of Professor J. W. L. Vogt, of the University of Christiania, on the nature of fused silicates seems to point to physical solution rather than chemical combination. *III. The Application to Industrial Needs.*—Some of the facts brought out in this section are: A million dollars worth of copper are refined monthly; 100,000 horsepower are consumed in producing calcium carbide; a reduction in the cost of aluminum from $5 to 30 cents. Sodium in about the same ratio. With regard to the future it may be noticed that electrolysis applies, *first*, to the decomposition of the most purified chemical compounds, whose decomposition by non-electrical methods is difficult or too expensive; *second*, high temperature work; *third*, as applied to ordinary chemical processes where work of decomposing, reducing, or perducing is done to best advantage. The most abundant oxide in the solid crust of the earth is silicon oxide, which is estimated at 58.3 per cent. and Mr. F. J. Tone, of Niagara Falls, has been the first to produce the element silicon by the electric furnace on a large scale. Electricity may also be well used to take off the "peak of the load in the open-hearth steel furnace." Calcium bids fair to be made cheaply by electrical methods in the near future. This is of great interest, as at temperatures above red heat, calcium is the strongest metallic base in existence. Magnesium and beryllium may be used in alloys to advantage. The electrical production of ferro-alloys, other carbides than that of calcium, the limitless field of organic chemistry are also discussed.

S. P. SADTLER.

Notes on the Industrial Electrolysis of Water. BY W. S. LANDIS. *Trans. Amer. Electrochem. Soc.*, 1904.—The literature on this subject contains works by M. U. Schoop and V. Engelhardt. The work is either carried out in acid or alkaline solutions, lead being generally used in the first case and iron in the latter. Diaphragms are used to keep the gases separate and are generally of iron and an alkaline electrolyte is used. The diaphragm is composed of strips which admit of the passage of the current and does not come into the electric circuit because of the solution offering less resistance than the metal which would give rise to a counter-electromotive force. In an apparatus designed by Professor W. S. Franklin, of Lehigh University, about 20 amperes are used, voltage 3.8 and an efficiency of 38 per cent. With power at $50 a kilo-watt-year a cubic meter of mixed gases (two-thirds hydrogen and one-third oxygen) would be 4 to 6 cents. This includes interest and sinking fund on the cost of the plant. The same amount of gas from zinc and sulphuric acid and barium peroxide would be about 40 cents at prices prevailing about March 15th of this year. By the Linde method of producing oxygen from liquid air the cost per cubic meter of 50 per cent. purity is 1 to 2 cents. This makes the cost of diluted oxygen alone very cheap by other than electrical means.

S. P. SADTLER.

Observations in the Preparation of Electrolytic White Lead.

BY C. F. CARRIER, JR., A.C. *Trans. Amer. Electrochem. Soc.*, 1904.—The original patents of Luckow (D. R. P. 91,707, and 105,143) specified that 1.5 per cent. solution of a mixture of 90 parts sodium chlorate and 10 parts of sodium carbonate should be electrolyzed between a hard lead cathode and a soft lead anode—carbon dioxide and water being added as required. It was found by LeBlanc that the carbon dioxide must be greatly diluted with air to get a true white lead. The process of Richards and Roepper (U. S. Patent 644,779) consists in electrolyzing a 5 per cent. solution of a mixture of 1 part sodium sulphate and 40 parts of sodium acetate and a small amount of some nitrate to aid the solution of the anode. With a current density of 100 to 200 amperes per sq. m., the acetic acid ions are supposed to be decomposed at the anode yielding carbon dioxide to precipitate the white lead, the necessary admixture of hydroxide being formed by the action of the sulphite.

Four experiments are described as follows:

1. 5 parts of air to 1 part carbon dioxide (instead of 20). Volts 2.4 to 2.8.
2. 1.5 per cent. of mixture of 80 parts sodium chlorate and 20 parts sodium carbonate. Volts 2.8 to 3.10. Current density 50 amperes per sq. m. Carbon dioxide same dilution as No. 1.
3. 5 per cent. of sodium acetate proportion of air to carbon dioxide. 20, to 1—copper cathodes and sodium carbonate to prevent deposition of lead on cathodes. Volts 1.6 to 2.
4. Solution 1.5 per cent. of mixture of 90 parts sodium chlorate and 10 parts of sodium carbonate. Air to carbonate, 20 to 1. Volts 2.1 to 2.8.

Results.—Calculated percentage of lead for white lead, 79.46 to 80.13.

	Per cent. of Pb.		Sol. eff. of anode.	Yield. Per cent.
	I.	II.		
1	78.28	78.18	100.00	91.81
2	78.89	78.74	97.92	97.71
3	80.74	80.73	100.00	96.75
4	80.74	80.81	99.67	98.43

Copper cathodes reduce the voltage. The anode precipitates badly with high current densities. With enough hydroxide to precipitate white lead, spongy lead is precipitated on the cathode. Nitrates have a higher efficiency than chlorates.

S. P. SADTLER.

Adaptability of Artificial Graphite Electrodes. BY G. L. COLLINS, 2nd E.E. *Elec. Chem. Ind.*, July, 1904.—The chief points in favor of artificial graphite are (*a*) great purity, (*b*) high electrical conductivity, (*c*) lubricating properties, (*d*) ease of machining, (*e*) strength and resistance to oxidizing and disintegrating action. They can be used for electric furnace work without waste by threading a joint between the partly worn and shortened electrode and the new section. The thread is given a slight taper and the shoulders are faced so as to make a tight joint.

The cost of machining both ends of rods 6 and 8 inches in diameter is about 50 and 60 cents respectively, and the losses of about 3 inches of electrode length are about 59 cents and 97 cents, making the total cost of a 6-inch joint $1.09 and for the 8-inch joint $1.57 or about 11.5 per cent. of the cost of the electrodes themselves in length of 48 inches.

As to the carrying power, 5000 amperes may be used with 8-inch electrodes without appreciable heating at the joints and from 3,000 to 4,500 with 6-inch electrodes, while not more than 1,500 amperes can be carried efficiently with amorphous carbon electrodes.
S. P. SADTLER.

Results of an Investigation of the Durability of Paints for the Protection of Structural Work. BY ROBERT JOB. *J. Franklin Inst.*, July, 1904.—The action of three paints, in use by the Philadelphia & Reading Railroads, under conditions of actual service, is discussed and the reasons for their different lasting qualities is clearly shown. The compositions of the pigments are as follows :

	No. 8. Per cent.	No. 10. Per cent.	No 12. Per cent.
Silica	9.35	17.07	34.10
Alumina	4.44	5.06	19.56
Sesquioxide of iron	21.07	22.74	23.24
Sulphate of lime hydrated	64.70	52.21	10.66
Alkalies	0.44 (by diff.)	2.92 (by diff.)	0.49
Water combined with iron and clay	....	....	9.75
Prussian blue	....	....	2.10
Free sulphuric acid	None	None	None
Carbon black	....	....	0.32
Calcium carbonate	None	None	None
Total,	100.00	100.00	100.22
Total water combined			11.88

They will be seen to each contain about 22 per cent. of sesquioxide of iron and 78 per cent. of inert filler. The differences in durability were quite marked, No. 12 being the best, No. 10 intermediate, and No. 8 the poorest. As they were so similar in chemical composition, the differences were probably physical.

Microscopical examination showed that the particles in No. 12

were by far the finest and they varied in the three paints in the order of their durability. As the volumes of spheres are to one another as the cubes of their diameters, by calculation, it was found that the average volume of particles of No. 8 pigment was about 8,000 times greater than that of No. 12.

In order to show this by a practical test, 4 parts of the pigment paste are mixed with 10 parts of fine raw linseed oil and a few drops are placed on glass slides placed vertically and kept at a temperature of 100° F. The slides were then examined by means of the microscope at a point one-half inch from the top.

Besides the standard pigments ground in oil, clay, silex, gypsum, barytes, carbonate of lime (whiting) calcined red oxide and yellow ochre were tried and their fineness was found to be about the order here given with ochre the finest.

In making up a paint the greatest durability was obtained with natural unburned ochre with almost 10 per cent. of hydrated sulphate of lime and 2.4 per cent. of tinting material.

S. P. SADTLER.

AGRICULTURAL CHEMISTRY.

Yearbook of the United States Department of Agriculture, 1903. *U. S. Dept. Agr., Yearbook*, 1903, 728 pp.—In addition to a review of the work of the Department during the year by the Secretary of Agriculture and the usual summary of information on various subjects, the Yearbook for 1903 contains 32 miscellaneous semi-popular articles of which note is here made of those of more or less interest from the standpoint of agricultural chemistry.

Some results of investigations in soil management are presented by F. H. King. The discussion relates mainly to the improvement of southern soils, and means are suggested for this purpose. L. F. Kebler discusses the adulteration of drugs, attention being given to early instances of adulteration, methods of analysis, factors affecting the quality of drugs, the extent and nature of adulteration, importance of purity, establishment of standards, and the proposed study of drugs and their preparation by the Association of Official Agricultural Chemists. The article on "Determination of Effect of Preservatives in Foods on Health and Digestion," by H. W. Wiley, covers essentially the same ground as Circular 13 of the Bureau of Chemistry noted below. J. H. Shepard gives an account of the work with macaroni wheat in the United States, and R. H. True discusses the culture of drug plants. "Wheat Flour and Bread" is the subject of an article by H. Snyder and C. D. Woods in which the following subjects are discussed: Cereals used in bread-making, process of bread-making, losses of material in bread-making, composition of bread, different grades of flour, digestibility of bread, and nutritive value of bread. The finer grades of flour are shown to be more nutritious than the coarser grades, although the latter may be especially desirable in certain cases on account of their stimulating action on the alimentary tract. C. O. Townsend discusses the relation of sugar-beets to general farming and C. M. Dougherty presents statistical information on the industry in oil seeds. Recent progress in timber preservation is reviewed by H. von Schrenk. It is believed to be profitable to treat inferior cheap timbers, and preservatives are recommended for fence posts, structural timber, ties, and piling. "Some Soil Problems for Practical Farmers" is the subject of a general article by E. C. Chilcott, in which the importance of crop rotations is especially emphasized. H. W. LAWSON.

Results of Borax Experiment. BY H. W. WILEY. *U. S. Dept. Agr., Bureau of Chem. Circ. No.* 15, 27 pp.—The first report on the investigations being conducted by the Bureau of Chemistry to determine the influence of various substances added to foods upon digestion and health appears as Bulletin No. 84 of that Bureau. As the number of copies of this bulletin is very limited, this circular, which is a digest of the bulletin, has been prepared for more general distribution. The experiments reported were made with 12 men and dealt exclusively with the influence of boric acid and borax. The plan of the work and conclusions are given in the circular. Five series of experiments varying in length from 30 to 70 days were conducted. Each experiment consisted of three periods, designated fore period, preservative period, and after period, the time assigned to each of these periods varying in the different experiments. The preservative, either as borax or boric acid, was administered during the second period of each experiment, in the food or in capsules and in quantities progressively increased for the purpose of ascertaining the limit of toleration by each individual. Much of the data was recorded by the subjects themselves who were placed upon their honor and required to continue their regular habits of life except as regards eating and drinking. Medical supervision was exercised by an officer of the public Health and Marine Hospital Service.

The ratio of food consumed to body weight was not appreciably affected by the preservative. In general the preservative tended to diminish the weight of the body. About 80 per cent. of the borax and boric acid was excreted by the kidneys. Traces were found in the feces and considerable quantities in the perspiration. The elimination of nitrogen was greatest during the fore period and least during the after period. The elimination of phosphorus was distinctly increased by the preservative. No marked influence upon the metabolism of fat was observed. The preservative showed a slight tendency to lessen the oxidation of the food in the body. A marked tendency on the part of the preservative to increase the total solids excreted in the feces and to decrease the total solids excreted in the urine was observed. Boric acid tended to increase the acidity of the urine while borax tended to lessen the acidity, indicating that a large part of these preservatives are excreted unchanged in chemical composition. Where a trace of albumin in the urine was normally present the preservative tended to increase the amount. Blood examinations warranted no definite conclusions.

The protracted administration of 4 grams of boric acid per day or its equivalent in borax resulted frequently in nausea, loss of appetite and inability to perform work and may be regarded as the limit of toleration. In many cases 3 grams produced the same symptoms. It is considered certain that a normal man could not long continue to receive 3 grams per day. In some cases less than 3 grams produced marked disturbances of normal conditions. One-half gram administered daily for 50 days showed unfavorable results in some instances and it is believed that this amount is too large for the normal man to receive regularly. "On the other hand it is evident that the normal man can receive one-half gram per day of boric acid, or of borax expressed in terms of boric acid, for a limited period of time without much danger of impairment of health."

It is concluded that "both boric acid and borax, when continuously administered in small doses for a long period, or when given in large quantities for a short period, create disturbances of appetite, of digestion and of health." H. W. LAWSON.

Studies on the Digestibility and Nutritive Value of Bread at the Maine Agricultural Experiment Station, 1899-1903. BY C. D. WOODS AND L. H. MERRILL. *U. S. Dept. Agr., Office of Expt. Stas. Bull. No.* 143, 77 pp.—The digestibility of bread made from Graham flour, entire or whole wheat flour, and standard patent flour was studied in 32 digestion experiments with men. The results are summarized along with the results of similar experiments previously reported. The nutrients of bread when eaten alone were not so completely digested as when the bread was eaten with milk. In general, white bread was more digestible than entire wheat bread and entire wheat bread more digestible than Graham bread. Although the Graham flour contained more protein than the white flour, the results showed that a pound of white flour furnished more digestible protein and more energy than a pound of Graham flour. On the other hand much less patent flour than Graham flour is obtained from the same quantity of wheat. The income and outgo of nitrogen was determined in these experiments. The digestibility of the protein in the bread made from the different grades of flour was also determined in artificial digestion experiments, the results showing that the pepsin solution used acted with almost equal readiness upon the protein of all three kinds of bread. An investigation of methods for the separation of feces in digestion experiments is also reported in this bulletin.

H. W. LAWSON.

Entire Wheat Flour. BY C. D. WOODS AND L. H. MERRILL. *Me. Agr., Expt. Sta. Bull. No.* 103, pp. 61-80.—Studies on the composition, digestibility, and nutritive value of entire wheat flour as compared with patent flour and Graham flour are reported. It is estimated that 100 pounds of standard patent flour are equivalent to 104 pounds of entire wheat flour as regards digestible protein and available energy. This article covers to a certain extent the same ground as the bulletin noted above. A milling experiment is also reported. H. W. LAWSON.

Wheat and Flour Investigations. BY H. SNYDER. *Minn. Agr. Expt. Sta. Bull. No.* 85, pp. 179–224.—Six articles are included in this bulletin.

The characteristics of wheat kernels were studied with a view to determining physical conditions associated with high and low protein content. Light-weight shrunken seeds showed a tendency to contain a higher percentage of protein than heavy-weight plump seeds. When otherwise perfect, small seeds contained less protein than large seeds. Comparisons were also made on the basis of color irrespective of size or weight. The dark-colored seeds were richer in protein than the light-colored seeds. In selecting seed wheat for the purpose of increasing the protein content it is concluded that preference should be given to medium-sized, heavy-weight and dark-colored flinty seeds.

A study was made of the composition and bread-making value of different grades of flour and milling products produced by the roller process. Analyses of the whole wheat and the different products are reported, "The fifth middlings flour produced the best quality of bread, both in texture and color."

The relative protein content of wheat and flour was investigated. Numerous analyses were made of wheat and the principal flour products from 3 mills. In general the clear grade flour was found to contain a higher percentage of protein than the original wheat. The bran and other offals contained a lower percentage. The patent flours contained less protein than the clear grade flours but made better bread. The gliadin content increased with the grade of flour, the highest amount being found in the first patent flour. The conclusion is drawn that the most nitrogenous flours are not always produced from wheats of the highest protein content, and also that it is far more desirable to secure wheat with a large protein content in the endosperm than wheat with a large protein content in the germ and bran.

An examination of an ancient Egyptian wheat believed to be 3,700 years old showed 3.94 per cent. of ash in the kernels, of which 41.1 per cent. was phosphoric acid. The protein amounted to 21.87 per cent. One gram yielded 4.086 calories. The starch grains appeared identical, microscopically, with those in modern varieties of spelt.

The influence of storage and bleaching upon flours was studied with results indicating that there is no danger of deterioration in either bread-making properties or food value from storage, provided the flour is made from sound wheat and stored in a dry, well-ventilated room, and also that there is no gain from bleaching purified flours made from a good quality of wheat.

The results of experiments concerning the relative food value of Graham, entire wheat and straight grade flours are summarized from Bulletin 126 of the Office of Experiment Stations of the U. S. Department of Agriculture previously noted in this Journal (R. 25, 333). H. W. LAWSON.

Report of the Food Commissioner. BY E. F. LADD. *N. Dak. Agr. Expt. Sta. Rep.*, 1904, pp. 132–228.—This is a detailed report on food inspection in North Dakota during 1903. During October, November and December 268 samples were examined, of which 87 were found adulterated. H. W. LAWSON.

Report of the Chemist. BY C. H. JONES. *Vt. Agr. Expt. Sta. Rep.*, 1903, pp. 191–203.—This includes suggestions for the testing of cream by the Babcock method based upon the results of a series of experiments; analyses of 9 species of edible fungi, 6 infant foods, and miscellaneous materials; and an article entitled "On the Quantitative Separation of Maltose and Lactose," by C. I. Boyden, reprinted from Vol. 24 of this Journal. The water content of the mushrooms varied from 89 to 95 per cent. The dry matter contained from 6.73 to 23.80 per cent. of ash, 20.31 to 63.75 of crude protein ($N \times 6.25$), 4.38 to 29.76 of crude fiber, and from 1.25 to 5.81 of ether extract. A considerable proportion of the nitrogen in all the samples was found to be in the non-albuminoid form. The same species taken at different times and places showed marked variations in composition. The infant foods analyzed were lactated food, Eskay's albuminized food, peptogenic milk powder, Horlick's malted milk, Mellin's food, and cereal milk. H. W. LAWSON.

Foods and Food Control. BY W. D. BIGELOW. *U. S. Dept. Agr., Bureau of Chem. Bull. No.* 69, Part VI, pp. 463–503.—This part, completing Bulletin 69, is a digest of the food laws in force in the United States on July 1, 1902, and serves also as an index to the parts of the same bulletin previously issued.

H. W. LAWSON.

Foods and Food Control. By W. D. Bigelow. *U. S. Dept. Agr., Bureau of Chem. Bull. No.* 83, Part I, 157 pp.—This is a compilation of Federal and State legislation enacted during the year ended July 1, 1903. H. W. Lawson.

A Summary of Recent American Work on Feeding Stuffs. By C. F. Langworthy. *U. S. Dept. Agr., Office of Expt. Stas. Rep.*, 1903, pp. 513–536.—From September, 1900, to February, 1904, the period covered by this article, analyses of 11,749 samples of feeding-stuffs were reported in the United States. Several special studies were made and numerous feeding, digestion, and metabolism experiments were conducted. This article summarizes also the investigations relating to analytical methods and the poisonous properties of certain plants sometimes eaten by farm animals, and reviews the progress made in the inspection and control of feeding-stuffs in the United States since the first law on this subject was passed in 1897.
H. W. Lawson.

The Composition of Texas Cotton-seed Meal. By H. H. Harrington and G. S. Fraps. *Tex. Agr. Expt. Sta. Bull. No.* 70, 15 pp.—Analyses were made of 46 samples of cotton-seed meal, representing 43 mills and 34 counties. The nitrogen content of 13 samples was between 7 and 7.5 per cent., 19 samples between 7.5 and 7.9 per cent., and 14 samples above 7.9 per cent. It is noted that of 151 samples of cotton-seed meal examined in nine other states only 8 samples contained above 7.5 per cent. of nitrogen. The conclusion is therefore drawn that Texas cotton-seed meal on the average is richer in nitrogen than cotton-seed meal from other sections and should have a higher commercial value. The nitrogen content was highest in samples from the western part of the state and lowest in samples from the eastern part. It is suggested that this difference may possibly be due to a difference in rainfall. The fat content of the samples varied from 6.93 to 18.16 per cent., the data warranting no general conclusions. H. W. Lawson.

The Chemical Composition and Feeding Value of Rice Products. By C. A. Browne, Jr. *La. Agr. Expt. Sta. Bull. No.* 77, pp. 430–458.—The author describes the structure of the rice hull and kernels, reports analyses of rice products, discusses the rancidity of rice feeds and the extraction and utilization of rice oil, and gives the results of digestion experiments with rice bran and rice polish. In experiments with steers 61.5 per cent. of the dry matter in rice bran and 84.6 per cent. of the dry matter in rice polish were digested. The corresponding coefficients for protein were 64.7 and 65.6. In artificial digestion with pepsin solutions, however, 83.5 per cent. of the protein in rice bran and 90.2 per cent. of the protein in rice polish were digested. It is believed that the digestive coefficients of protein as commonly determined are much too low and that some correction should be made. The feeding of rice products to farm animals is also discussed. H. W. LAWSON.

Chemical Work on Sorghum. BY F. S. SHIVER. *S. C. Agr. Expt. Sta. Bull. No.* 88, pp. 20–31. Analyses of sorghum grown in various variety, culture, and fertilizer experiments at the station are reported. The results show that where proper care is exercised in the selection of seed, sorghum having a high sugar content and coëfficient of purity and admirably adapted for syrup-making can be grown in the state. H. W. LAWSON.

Progress of the Beet-sugar Industry in the United States, 1903. BY C. F. SAYLOR. *Washington Govt. Printing Office,* 1904, 184 pp.—The report shows continued progress in this industry. During the year, 240,604 tons of sugar were manufactured as compared with 218,400 tons in 1902. The culture of sugar-beets is discussed at considerable length. H. W. LAWSON.

Factors of Availability of Plant Food. BY G. S. FRAPS. *Am. Chem. J.*, **32**, 1–13.—Four factors of availability are considered : (1) Chemical, referring to the presence of plant food in forms capable of being taken up directly by plants; (2) physical, referring to the enclosure or protection of chemically available plant-food by soil particles; (3) weathering, referring to the conversion of plant-food into chemically available forms during the growing season ; and (4) physiological, referring to the difference in the power of plants to absorb food. Some of these factors were studied experimentally with conclusions expressed by the author as follows : "The effect of weathering under different conditions was studied on three soils, the chemically available plant food being measured by N/5 or N/50 nitric acid. The results vary somewhat with the nature of the soil. Moisture alone causes an average increase in chemically available potash and phosphoric acid in the soils. The increase is not large. Calcium sulphate and calcium carbonate cause an average decrease in chemically available potash. Calcium carbonate causes a decrease in phosphoric acid ; calcium sulphate an increase, which is especially large in one case. The presence of calcium salts in a soil has a decided influence on the potash and phosphoric acid extracted by N/5 nitric acid. Starch or sawdust, in decaying, decreases the chemically available phosphoric acid, but in each case increases the potash, as much as 100 per cent. in one case. Stable manure is valuable not only for the plant-food in it, but for its action in liberating potash. Weathering availability cannot be entirely disregarded in considering available phosphoric acid and potash in soils, particularly when calcium sulphate or carbonate or much organic matter is present in the soil."

H. W. LAWSON.

The Water-soluble Plant Food of Soils. BY H. SNYDER. *Proc. Soc. Prom. Agr. Sci.*, 1903, pp. 25–31.—The conclusion is drawn from data presented that over 81 per cent. of the phosphoric acid of a wheat crop was secured from forms insoluble in water. The article is to a certain extent a critical review of Bulletin 22 of the Bureau of Soils of the U. S. Department of Agriculture. H. W. LAWSON.

Concerning the Function of Sodium when Used in Nitrate of Soda. BY. H. J. WHEELER, B. L. HARTWELL AND G. E. ADAMS. *R. I. Agr. Expt. Sta. Rep.*, 1903, pp. 237–267.—The literature of this subject is reviewed and the results of experiments at the station are reported and discussed. When employed in amounts furnishing the same quantity of nitrogen, nitrate of soda was frequently more effective than ammonium sulphate. This difference was not believed by the authors to be attributable at least more than to a limited extent to a direct manurial action of the sodium, but due chiefly to the difference in the chemical reaction of the soil brought about by the two salts. Nitrate of soda leaves a basic residue while ammonium sulphate leaves sulphuric acid as a residual product. H. W. LAWSON.

A Review of the Results of Experiments with Nitrate of Soda. BY E. B. VOORHEES. *N. J. Agr. Expt. Sta. Bull. No.* 172, 32 pp.—The author discusses the use of fertilizers in general and nitrate of soda in particular and concludes that there are at least two suggestions of fundamental importance which cannot be too strongly urged upon the attention of farmers: "(1) That the constituents nitrogen, phosphoric acid, and potash, as found in commercial supplies furnishing these elements, do serve as plant-food, nourishing the plant in the same manner as those in home manures, and should, therefore, be liberally used, in order to guarantee maximum crops. (2) Of these constituent elements nitrogen is of especial importance, because it is the one element, which, in its natural state, must be changed in form before it can be used by the plants. Hence, its application in an immediately-available form is especially advantageous for quick-growing vegetable crops, whose marketable quality is measured by rapid and continuous growth, and for those field crops which make their greatest development in spring, before the conditions are favorable for the change of the nitrogen in the soil into forms usable by plants."

H. W. LAWSON.

Experiments with Nitrogenous Fertilizers. BY H. J. PATTERSON. *Md. Agr. Expt. Sta. Bull. No.* 91, pp. 25–53.—The author discusses the sources of nitrogen, assimilation of atmospheric nitrogen by plants, and other topics, and reports the results of a considerable number of experiments with nitrogenous fertilizers conducted at the Maryland Station. H. W. LAWSON.

Paris Green Spraying Experiments. BY J. K. HAYWOOD. *U. S. Dept. Agr., Bureau of Chem. Bull. No.* 82, 32 pp.—The experiments reported in this bulletin were carried out by the Department of Agriculture in coöperation with several experiment stations and had for their object the determination of the amount of soluble arsenious oxide which may be present in Paris green without causing injury to foliage. When sprayed without the use of lime, 6 per cent. of soluble arsenious oxide in Paris green was found to be safe for apple and pear trees and 4 per cent. for plum trees. When used with lime, 7 per cent. was regarded as safe for apple and pear trees, 5 to 6 per cent. for plum trees, and 4 to 5 per cent., for peach trees The author recommends the use of lime in all cases. H. W. LAWSON.

Proceedings of the Twentieth Annual Convention of the Association of Official Agricultural Chemists Held at Washington, D. C., November 19, 20, and 21, 1903. Edited by H. W. WILEY. *U. S. Dept. Agr., Bureau of Chem. Bull. No.* 81, 252 pp.—This is the official report of the proceedings. A summarized account has already appeared in this Journal, **26**, R. 73. H. W. LAWSON.

Resume of Investigations since 1893 at the Wisconsin Agricultural Experiment Station. *Wis. Agr. Expt. Sta. Rep., 1903*, 414 pp.—This report summarizes concisely the work of the station from 1893 to 1903. As the investigations have covered a wide range of subjects and have been very fruitful in their results, a report of this character is exceptionally valuable. Chemical studies have entered largely into many of the lines of work. H. W. LAWSON.

Organization of the Bureau of Chemistry. *U. S. Dept. Agr., Bureau of Chem. Circ.* 14, 15 pp.—In addition to statements concerning the organization and work of the Bureau, the circular contains a complete list of the publications of the Bureau. H. W. LAWSON.

PATENTS.

JANUARY 26, 1904.

750,361. Henri Harmet, St. Etienne, France. **Electrometallurgy of Iron.** Ore and reducing materials are charged in an electric furnace with an excess of carbon and exclusion of air, the interior of the furnace being under pressure.

750,371. Hugo Karl, Sockenheim, and Jean Schmidt, Mannheim, Germany. **Artificial leather.** Two layers of wadding with fibers at right angles are impregnated with a solution of white burnt vitriol 3; in poppy oil 97 per cent. is mixed with fibrin glue 80, fish oil 10, extract of leather and potash 2 each, and camphor 6 parts are diluted with hot water to 80 or 90 per cent., removing the excess of liquid and drying the same, thickening it with caoutchouc 1 to benzene 50, and Borneo mort and resin, equal parts, finally drying and finishing.

750,493-4. Alfred Schutt, Charlottenburg, Germany. Generating **motive power.** The first for mixing methyl chloride and water, vaporizing the methyl chloride, using it to drive an engine while leaving the water in a liquid condition. The second mixes sulphurous acid with a mineral oil, vaporizes and uses the acid, the oil being left in a liquid condition.

750,512. Wm. H. Wherry, Cleveland, Ohio. **Flux** for uniting copper and steel. Red phosphorus and muriatic acid, enough to form a paste, may be added to the molten metal used in welding the ends of rails.

750,541. John W. H. James, Philadelphia, Pa. **White lead.** A mixture of lead oxide, water and a little acid is heated and treated with acetic acid and carbon dioxide, whereby a carbonate is made which is subjected to oxygen.

750,548. Philip F. Lenhart, New York City, N. Y. Assignor to Old Colony Corkwood Co., Portland, Me. **Corkwood.** Calcium chloride and glycerin $^1/_{16}$ each, sodium carbonate 1, glue 8, water 32, and cork 60 parts by weight, may be molded or cut.

750,575. Richard Blume, Magdeburg, Germany. **Varnish substitute.** Rosin pitch 50, drying oil 200, and non-drying oil 20, are mixed at 150° C. and added to rosin oil in the proportion of 10 to 80 parts. 2½ parts of manganese resinate and 7½ lead resinate are then added.

750,627. Max Engelmann, Elberfeld, Germany. Assignor to Farbenfabriken Elberfeld Co., New York, N. Y. **Dialkyl barbituric acid.** Guanidine and the ethyl ester of diethyl cyano-acetic acid are condensed with sodium ethylate and then treated with hot sulphuric acid to split off the two imino groups in 2,4-position from the resulting 5-ethyl-2,4-diimino-6-oxy-pyrimidine.

750,682. James McCormack, Chicago, Ill. **Boiler-cleaning compound.** Hemlock extract 270, soda-ash 150, and water 130 parts are mixed and evaporated to a dry compound.

FEBRUARY 2, 1904.

750,832. Andrew A. Dunham, New York, N. Y. Assignor to Casein Co. of America, of New Jersey. **Food casein.** Casein is dissolved in sodium bicarbonate, pepsin or other digestive agent added and the whole dried on a revolving cylinder at not less than 212° F. The dried casein is then disintegrated, forming a light flocculent powder.

750,871. Adolf J. Marschall, Little Falls, N. Y. **Battery fluid.** Zinc chloride 80, ammonium chloride 6, and water 100 parts.

750,905. James T. South, Brighton, England. **Artificial slate.** Composed of Portland cement 2000, ferric oxide 2, vegetable blue black 50, permanganate of potash 1 and color to suit. The mass is molded and cured, during which process it is occasionally drenched with water.

750,945. Albert Busch, Brunswick, Germany. Assignor to Bauer & Co., Berlin, Germany. **Water-soluble albuminoids.** Albuminoids soluble in alkali are combined with alkali salts of fatty acid substituted glycerin phosphoric acids, such as stearyl glycerin phosphoric acid. (See *J. prakt. Chem.* (2), **28,** 240.)

750,986. Valentin Lapp, Leipzig, Germany. **Inside coating for fermenting vessels.** A solution of galls is applied to the inside of metal vessels and allowed to act for several hours, then repeated, and a boiling solution of hops applied, then a coating of shellac, then a solution of raw gypsum which is dried and finally the vessel is filled with boiling raw gypsum solution with some thick beer or worts, the boiling being continued five to six hours.

751,038. Thomas R. Wollaston, Manchester, England. Apparatus for **continuous decantation.** A series of corrugated plates arranged one over the other in a tower, and the plates all pivoted in the center and connected together so as to be inclined first to one side, then to the other. The current of liquid flows upwards.

751,076. Arthur Hough, Dover, N. J. **Nitrated carbohydrate.** Contains $16^1/_2$ per cent. nitrogen, its constitution expressed by $C_{12}H_{12}(NO_2)_8O_{10}$, a stable orange-colored powder of high explosive power and silky feel, insoluble in alcohol, ether and dilute ammonium hydroxide, soluble in ether-alcohol and acetic ether, soluble with difficulty in concentrated sulphuric acid. Made from corn-starch.

751,080. Friedrich Kruger, Berlin, Germany. **Fire-proof bricks.** A liquid mass of an alkaline silicate is heated and thickened with unburnt gypsum and a little asbestos to a plastic mass which is molded and burned at a red heat.

751,085. Leon P. Lowe, San Francisco, Cal. **Gas apparatus.** A tower filled with brick checker-work has two combustion chambers, one in the middle the other near the top, a pipe connecting the ash-pit in the bottom of the tower with the top, and a steam feed delivery pipe into the upper combustion chamber. Hydrocarbon fuel is fed into the end chamber, mixed with steam, and the resulting gas sent through the tower and delivered at the bottom.

751,170. Alexander Kollrepp, Berlin, and Alfred Wohl, Charlottenburg, Germany. **Purifying sugar juice.** The solution is electrolyzed, at the same time adding lead saccharate which is afterwards decomposed by alkali for re-use.

751,172. George T. Howard, LaGrange, Ind. Assignor one-half to Wm. J. Applegate, Chicago, Ill. **Artificial fuel.** Loam 55, coal screenings 25, sawdust 5, petroleum 3, oil meal and milk of lime 3 each, paraffin and dissolved glue one each, and tar 4 parts.

751,187. Stanislaw Lewiak, Warsaw, Russia. **Bleaching oils.** A jacketed vertical boiler has an elaborate stirrer and an air blast with suitable feed and delivery pipes.

751,216. Karl Stephan and Frederick Kaiser, Berlin, Germany. Assignors to E. Schering, same place. Acidyl derivatives of **rufigallic acid.** A purgative medicine made by the reaction of rufigallic acid alkyl ethers on an acidyl reagent, forming a yellow-brown powder insoluble in water, difficultly soluble in alcohol and ether.

751,280. Calocero Giglio and Bachir Zaouche, Paris, France. **Adhesive.** Roasted potato starch 2 parts are dissolved in 100 parts boiling water, and 15 parts of gas pitch, acetic acid 3, tallow 1, and glue 5 parts are mixed and the whole heated to 100° C. used for briquetting.

751,303. Michel Krouchkoll, Paris, France. **X-ray tube.** An auxiliary tube is attached to the main tube and filled with minute fragments of glass to regulate the vacuum in the main tube.

751,350. Joseph M. Schutz, Minneapolis, Minn. **Boiler furnace.** A combustion chamber is made below the level of the ash-pit, into which a blast of air forces a spray of hydrocarbon fuel in a tangential direction so as to establish a whirl, whereby perfect combustion of the mixed air and fuel is assured in the fire-box.

751,399. Guy R. Johnson, Chicago, Ill. **Reclaiming flue dust from Mesaba iron ore.** The dust is mixed with salt, heated to 2000° F., whereby the mixture is fused and stirred to form suitable lumps for use in the blast-furnace.

751,401. Edward H. Miller, London, England. Treating **refractory ores.** Lead zinc ores are mixed with silicious matter and pitch, briquetted, packed checkerwise open in a furnace, sprinkled with lime and the zinc volatilized, the lead and silver remaining in the residue which is smelted.

751,428. Albert Busch, Brunswick, Germany. Assignor to Bauer & Co., Berlin, Germany. **Soluble albumins.** Alkali-soluble albumins are combined with alkali salts of hexite substituted phosphoric acid, such as mannite, dulcite or sorbite phosphoric acid. See Carre: *Compt. Rend.*, 1903, p. 306.

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751,444. William J. Armbruster, St. Louis, Mo. **Pigment.** Zinc ores are treated with an acid solvent as nitric, the solution mixed with a solution of barium hydroxide and filtered, the filtrate treated with sulphuric acid and again filtered, and the various precipitates mixed.

751,454. Lewis A. Brown and Dwight Tredway, St. Louis, Mo. **Composite pipe.** Sulphur is melted, cement and sand mixed in, and the coating applied to galvanized sheet-metal pipe while in a plastic state.

751,468. Melvin W. Cottle, St. Louis, Mo. **Fuel block.** Assigned to Coaleo Fuel Manufacturing Co., same place. Comminuted coal 85, sawdust 8, rosin 5, and glue 2 parts are mixed and steamed at 250° F., then molded into blocks.

751,554. William G. Pope, St. Louis, Mo. **Effervescent nk tablet.** Nut galls 3, copperas 2, gum arabic 2, sodium biarbonate 4, citric acid 2, sugar 1, tartaric acid 4, oxalic acid 3, nd soluble blue 2 parts.

751,605. Max Bielefeldt, Berlin, Germany. **Priming owder.** Trinitronaphthalene 25, dinitronaphthol sulphonate of iaminophenol 10, mercury sulphocyanate 30, and potassium hlorate 35 per cent.

751,648. Noah V. Hybinette, Plainfield, N. J. Treating **opper ores.** A mixture of the crushed ore and a salt of an lkaline metal is roasted, a reducing agent as carbon is added to make an insoluble copper salt which is separated from the gangue mechanically.

751,664. Thomas T. Lyman, Montclair, N. J. Assignor to H. W. Johns, Manville Co., N. Y. **Insulating material.** Plaster of Paris is mixed with an excess of short fibered asbestos in a solution of sodium silicate, dried and soaked in dilute sodium silicate, compressed and dried, and these operations repeated, then burning to vitrifaction and buffing the surface.

751,711. Elwood O. Baylor, Adrian, Mich. **Building block.** The body of the block is made of wood fiber 2, sand and Portland cement each 1 part, and the surface is of gravel 3, and Portland cement 1 part.

751,712. Victor Bermont, Paris, France. **Hydrated zinc sulphide.** Ammonia is added to the crushed ore and the mixture filtered, to the ammoniacal liquor a solution of a soluble sulphide is added to precipitate metals other than zinc as insoluble sulphides, again filtering and drying or adding sodium sulphide to precipitate pure zinc salts.

751,724. Max Engelmann, Elberfeld, Germany. Assignor to Elberfeld Co., New York, N. Y. Process of making **dialkyl barbituric acid.** Thiourea and dialkyl cyano-acetic ester are condensed with alkaline alcoholates the imino group in position 4 split off by acids from the resulting 5-dialkyl-2-thio--4-imino-6-oxypyrimidine, and finally adding nitric acid to desulphurize the resulting 5-ethyl-2-thio-4-6-dioxypyrimidine.

751,751. Boaz D. Pike, San Francisco, Cal. **Explosive.** Ordinary gunpowder or a similar compound is reduced to a fine powder and the grains coated with china nut oil (a drying oil), or may coat the saltpeter and afterwards add the sulphur and charcoal.

751,753. Nathaniel B. Powter, Brooklyn, N. Y. **Phosphoric acid.** Edward H. Fallows, executor of said Powter. A suitable phosphate rock is heated in a closed retort and the fumes are exhausted and are forced into water, the acid being dissolved therein.

751,807. Heinrich Poettner, Dortmund, Germany. **Explosive.** Ammonium nitrate 83, copper oxalate 5, dinitrobenzene 1, and turmeric 11 per cent.

751,897. Guido Bodlander, Brunswick, Germany. Determining the amount of **carbon dioxide in gases.** The gases are passed through galvanic batteries in which they develop an electromotive force proportional to the amount of carbon dioxide contained in them, two batteries being included in the same circuit but opposed to each other, whereby the action of the free hydrogen and oxygen is neutralized and a variety of materials may be used as electrodes and electrolytes.

751,941. Emile Raynaud, Spy, and Leon Pierron, Jette St. Pierre, Belgium. **Sulphuric anhydride.** The gaseous mixture of sulphurous acid and oxygen is first brought in contact with a catalytic mass at a temperature less than that of reaction, and is then brought in contact successively with catalytic masses at increasing temperatures, till dissociation begins, then finally making contact with a mass at a lower temperature adapted to recombine any gases that have been dissociated.

751,972-3. Rudolf Berg, Pittsburg, Pa. Assignor one-half to Ferdinand Wenig, same place. Process and apparatus for **generating motor fluids.** A combustible gas is mixed with air and subjected to isothermal compression with water which is afterwards separated, then igniting the compressed heated gas in a closed vessel and bringing the ignited mixture in direct contact with the hot water in the closed vessel. The apparatus consists of a boiler, in the lower part of which is a furnace opening at the top into the water space of the boiler, and means for supplying gas under pressure.

751,981. George W. Gordon, Philadelphia, Pa. Assignor to Henry Arzt and Julius Sostmann, same place. **Preserving wood.** It is soaked in a solution of calcium hydroxide, sugar and glycerol.

751,990. John McGlashan, Cawnpore, India. Making **sugar.** The sugar solution is "pitched" with a yeast that cannot invert saccharose but does decompose invert sugar into alcohol and carbon dioxide and before final concentration and crystallization the alcohol is driven off.

FEBRUARY 16, 1904.

752,054. Ewald Engels, Dusseldorf, Germany. Treating **iron and steel.** The metals are heated to annealing temperature with silicon carbide and sodium sulphate, whereby the iron is carbonized.

752,064. James O. Green and Harry T. Martin, Whitewater, Wis. **Consolidating peat.** The fiber of the peat is destroyed by grinding to a fine powder and then hammering it with such rapidity as to produce sufficient heat to release tar enough to bind the whole together.

752,116. John J. C. Smith and Michael Smith, Passaic, N. J. **Floor covering.** Asbestos board is saturated with a solution of resin in gasoline and compressed.

752,165. Wilhelm Hasenbach, Mannheim, Germany. Assignor to Verein chemischer Fabriken, same place. Apparatus for making **sulphuric anhydride.** Alternate sheets of platinized fabric and wire netting are clamped in frames which are slid into place through openings in the side of the contact chamber, provision being made for a gas-tight joint.

752,286. Herbert H. Dow, Midland, Mich. Assignor to the Dow Chemical Co., same place. **Fractioning bromine** apart from chlorine. Brine containing bromine is oxidized, then blown with little air to obtain the purest bromine, which is recovered by sodium carbonate, then blowing out the rest of the bromine by much air and absorbing it in natural brine.

752,320. Jose Baxeres de Alzugaray, Bromley, England. **Extracting metals.** Ores of copper, lead, silver and zinc or similar mixtures are treated with acidulated solutions of alkaline chlorides which disintegrate the ore and dissolve the copper which is leached out, and the remaining ore roasted and leached in a similar manner to obtain lead, the zinc being dissolved and precipitated by an alkaline earth oxide and distilled.

752,323. Rudolf Berendes, Elberfeld, Germany. **Sensitizing dye.** Assigned to Farbenfabriken of Elberfeld Co., New York, N. Y. Diethyl sulphate is made to act on quinaldine and the product is treated with caustic alkali, giving dark crystals of metallic luster, soluble in water, alcohol and chloroform violet, insoluble in ether, benzene and ligroin, and sensitive for distinct colors of the spectrum.

752,331. Herbert H. Dow. Assignor to Dow Chemical Co., all of Midland, Mich. **Fractioning bromine** from chlorine. A limited amount of air is passed through oxidized brine to remove the purest bromine which is absorbed in caustic soda; this treatment is repeated obtaining a less pure bromine, and finally a large quantity of air is blown through and the impure brominated air is absorbed in natural brine.

752,359. John J. Reed, Labelle, Mo. **Syrup.** Granulated sugar, 43, brown sugar 26, strained honey 10, cream of tartar 0.2, and water to suitable consistency.

752,388. Arthur Eichengrun, Elberfeld, and Adolf Braun, Muhlhausen, Germany. Assignors to Elberfeld Co., New York, N. Y. Sensitive **photographic emulsion.** A sensitizing substance as $AgNO_3$ is combined with alcohol-soluble acetyl cellulose of No. 734,123.

752,392. Frank J. Gardner, Chicago, Ill. **Curing meats.** The meat is packed in a water-tight box with movable cover, and sprinkled with sodium chloride and sugar, etc., the cover weighted down on the meat so as to squeeze out the juice and form a brine in which the meat cures.

752,452. August B. Hohman, Richmond Hill, N. Y. Assignor to Charles J. Tagliabue, Brooklyn, N. Y. **Securing measuring instruments centrally in bottles, etc.** A removable collar with hinged compression bolts is made to fit under the flange or lip of a bottle, the compression bolts being adapted to turn up and engage with a cap that fits over the cork and is provided with a central tube to carry a thermometer or similar instrument.

752,485-6-7. All to Leonard S. VanWestrum, Berlin, Germany. **Sprinkling streets.** The first is for a solution of a soluble salt as calcium chloride and a non-volatile oil, the second for 90 parts water and 10 parts oil on the road and the last is for mixing the dust of the road with mixed oil and water and thus forming a concrete mass on the road.

752,562. Paul Julius, Ludwigshafen-on-Rhine. Assignor to Badische Anilin und Soda Fabrik, same place. **Red azo dye.** 4-chloraniline 5-sulpho acid is made to react on β-naphthol, giving the red dye which, on treatment with stannous chloride and hydrochloric acid, regenerates the sulpho acid and α-amino-β-naphthol.

FEBRUARY 23, 1904.

752,660. Mary A. Dillard, Selma, Ala. **Icing.** Powdered sugar 32, gum arabic 4, cream of tartar 7, and egg sufficient to make a paste.

752,677. Nicholas Heinz and Hermann Hegeler, Lasalle, Ill. **Making sulphuric acid.** Nitrogen compounds from any part of the apparatus are mixed with the sulphur gases entering the Glover tower.

752,744. Nicholas Zelinsky, Moscow, Russia. **Organic acids.** Petroleum derivatives are chlorinated, and then subjected to the action of magnesium and carbon dioxide, whereby such acids are obtained as $C_8H_{13}COOH$ and $C_{10}H_{17}COOH$.

752,804. George Rowland, Knoxville, Tenn. **Dyestuff.** A hard cake readily soluble in cold water consisting of soap combined with an aniline dye which is direct dyeing, needing neither acid nor alkaline mordant.

752,927. Heinrich F. D. Schwann, St. Louis, Mo. Making **aluminum sulphate.** Aluminous materials containing iron are chloridized to convert the iron into ferric chloride, which is then volatilized and removed thereby, then by roasting the silica is rendered insoluble, and sulphuric acid is added to form a sulphate, air being blown through the mixture.

752,947. Wilhelm Bauml, Ludwigshafen on Rhein. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, on Rhein, Germany. **Organic acid.** An acetate is caused to react with the sodium salt of chlorsulphonic acid to form acetic anhydride.

752,951. Myron G. Brownell, Denver, Col. **Rubber-like gum.** The gummy particles contained in the plant *picradenia floribunda utilis* are caused to agglomerate by a light hydrocarbon like gasoline into a plastic rubber substitute.

752,952. As above for the product thereof.

752,988. Richard A. Leigh, Denver, Colo. Assignor to Western Rubber Co., same place. **Rubber substitute.** The material of 752,952 is vulcanized with sulphur, coloring-matter, etc., being added.

753,060. Thomas J. Ford, Geneva, Ohio. Assignor two-thirds to Frank S. Turner and Charles S. Gladding, same place. **Razor strop dresser.** Babbitt metal, tin and zinc 1 part each to 36 parts of lead. Graphite is excluded.

753,097. Otto Palm, Jr., and Wm. T. Blomberg, New York, N. Y. Assignors to the Palm Letter Co., Cincinnati, Ohio. **Etching on metal surfaces.** A sheet of paper is coated with gum, the design printed on the gum in an ink of asphalt and beeswax, the uncovered gum removed from the paper and a light coating of asphalt given the paper and the metal surface; the design is transferred and the paper soaked off with water, the plate then etched with acid, and the design removed with equal parts of turpentine and alcohol.

753,144. Isidor Kitsee, Philadelphia, Pa. **Printing on tin.** The ink is made with an acid copper salt as copper sulphate thickened with dissolved gum.

753,177. Jokichi Takamine, New York, N. Y. **Gland extract.** A halogen acid is combined with a water extract of the suprarenal gland to form a stable compound adapted to raise the blood pressure in a patient.

753,208-9-10. Niels Poulson, New York, N. Y. **Fireproofing.** Cores are formed for doors, etc., of "Lignolith" and then covered with sheet metal. Lignolith is comminuted wood or mineral wool made into a paste with manganese oxide or chloride.

WM. H. SEAMAN.

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METALLURGICAL CHEMISTRY.

Side-blown Steel Converters. BY N. LILIENBERG. *Iron and Steel Metallurgist*, March, 1904 (read before the Philadelphia Foundrymen's Association).—The superheated steel made in small side-blow converters cannot compete with open-hearth steel or bottom-blown converter steel for heavy castings and for ingots to be rolled or forged. The small castings made from superheated steel may compete with cast-iron, malleable castings, drop-forgings, pressed steel and bronze. Superheated side-blown steel may be produced entirely sound and uniformly lower in carbon and manganese than other steels, and therefore particularly suitable for dynamo-magnet steel. The permeability and hysteresis curves of such steel approach those of Swedish iron; its analysis is, carbon 0.10, manganese trace to 0.04, silicon 0.02, phosphorus 0.04. The silicon in the pig-iron used need not be over 1.5 per cent., since extra heat is obtained by burning carbon monoxide to carbon dioxide inside the converter. The blown metal is very fluid, and thus gases can escape, so that it often acts like dead-melted steel; it is hotter than can be produced regularly in open-hearth furnaces, and is therefore suitable for making small castings. The loss in conversion is from 14 to 17 per cent., including about 5 per cent. loss in the cupola; in some works the total loss has been continuously 30 per cent., and has led to the abandoning of the process. Bottoms last 10 to 20 heats; bodies 40 to 50. The scrap from the casting-house is about 25 per cent., which can be returned to the cupola; if over this, it must be sold. Blast at 4 pounds per square inch, furnished by a blower with twin impellers, can be used; the blowing of two tons lasts about twenty minutes. Over half the carbon burns to carbon dioxide in the converter. J. W. RICHARDS.

Cupola Fan Practice. By W. H. Carrier. *Iron Age*, June 23, 1904 (read before American Foundrymen's Association).—Contains many important data of average cupola practice. Analyses of cupola gases show only about one-half the carbon completely burnt to carbon dioxide, and therefore that only two-thirds of the calorific power of the fuel is generated in the cupola. The center blast cupola, operating with less pressure than ordinary, burns two-thirds of the carbon to carbon dioxide with corresponding fuel economy. It requires 18,000 to 30,000 cubic feet of air per ton of iron melted, according as the fuel ratio varies between 1 to 12 and 1 to 7. Or, one can say in brief that there is required 216,000 cubic feet of air per ton of fuel used. The amount of air forced through a cupola will vary as the square foot of the pressure, and therefore the speed of melting in the same ratio. The melting capacity of a cupola under given pressure is nearly proportional to the area of its internal cross-section, *i. e.*, to the square of its internal diameter. These rules can be briefly condensed to the formula $W = 2\ D^2\sqrt{p}$, in which W is the pounds of iron melted per hour, D the inside diameter in inches, and p the pressure at the cupola in ounces per square inch. The air required per minute, in cubic feet, may be expressed as $C = \frac{1}{2}\ D^2\sqrt{p} = \frac{1}{4}\ W$. As for the power required, 37,000 cubic feet of air per minute moved against 1 ounce pressure per square inch requires 1 horse-power at 100 per cent. efficiency; at an ordinary efficiency of 60 per cent., each 22,200 cubic feet against 1 ounce would represent 1 horse-power. The power may be given by the formula $\text{H. P.} = \frac{D^2\sqrt{p^3}}{3800}$.

J. W. Richards.

Mesabi Ore in the Blast-furnace. By F. E. Bachman. *Iron Age*, May 26, 1904 (discussion before American Institute of Mining Engineers).—The Mesabi ore explosions are not true explosions, because the pressure is developed gradually, and stock is forced out of the explosion doors until the furnace is sometimes half emptied; such a development of gas, if done explosively, would surely burst the furnace. The writer thinks them due not to carbon deposition and consequent choking, but to the rapid combustion of fine carbon at the expense of oxygen from ferric oxide, which has reached a point of sufficient heat in the furnace without having been deoxidized by carbon monoxide. This reduction of ferric oxide by solid carbon generates enormous volumes of gas, when once started. Fine ore, *per se*, is not the cause of these explosions.

J. W. Richards.

Furnace Top Explosions. By F. C. Roberts. *Iron Age*, May 5, 1904.—Three theories have been proposed to account for these explosions: (1) Admission of air to the space above the stock. (2) The deposition of carbon. (3) The formation of an explosive mixture because of insufficient limestone in the burden. Regarding (1), the writer thinks it wrong, because most explosions take place while gas is escaping freely from the bleeder valves, and there is usually a large discharge of ore and stock, showing the explosion to originate below the surface of materials in the furnace. Explosions caused by air used to occur years ago, when the blast was often shut off and the bell not lowered, but such explosions are sharp and detonating in character, and not slow in action like the common type of explosion frequent at present. Regarding (2), the ore causes the gases to deposit carbon, which gradually chokes the furnace until the blast-pressure increases to an amount sufficient to break through the bridge, blowing the materials upwards with considerable force. Most furnace managers think this the correct explanation, as there are several facts supporting it. Regarding (3), Mr. F. F. Amsden has observed that when less than 27 per cent. of limestone was in the burden, using Mesabi ores, repeated top explosions occurred, and with over that amount they were absent; the theory built on this was that the carbon dioxide given off diluted the gases to a non-explosive mixture. Roberts thinks that the cause is primarily the deposited carbon, and that the carbon dioxide from the limestone reacts on this and thus removes the choking action and consequent explosion or upheaval. Since different ores caused carbon deposition at different rates and in varying quantities, the required amount of limestone to prevent explosions will vary. The size of the limestone lumps is also of importance. Using 30 per cent. of limestone in large lumps no explosions occurred; when this was crushed to 1 inch ring, explosions were frequent; on going back to large lumps, the explosions ceased. The explanation is evidently that the small pieces lose their carbon dioxide too high in the furnace to act on the deposited carbon, while the large lumps retain a large part of their carbon dioxide until below the zone of carbon deposition.

J. W. Richards.

A Furnace Charging and Distributing Apparatus. By F. C. Roberts. *Iron Age*, June 23, 1904.—Description of a rotating apparatus designed to secure a uniform distribution in the lower hopper of a blast-furnace, with materials of different physical characteristics, and also to provide means for controlling the distribution of coarse and fine materials. For this purpose numerous chutes are provided in the upper bell, adjustable at different angles, and which can be restricted or closed separately, if required. The working down of the charge is thus brought under perfect control. J. W. Richards.

Segregation and Diffusion in Steel. By B. F. Weston. *Iron Age*, May 19, 1904.—A review of the subject, compiled from different sources, with analyses for carbon on a small test bar of basic open-hearth steel. The piece was only 2 inches square by 5 inches high, yet showed from 0.04 to 0.14 per cent. more carbon in the centre than on the surface, the total carbon being between 0.50 and 0.60 per cent. J. W. RICHARDS.

The Permeability of Cast Steel. BY H. E. DILLER. *Iron Age*, June 23, 1904 (read before American Association for Testing Materials).—Castings for dynamos and motors are best made of the following compositions: Silicon, 0.10; sulphur, below 0.07; phosphorus, below 0.07; manganese, below 0.05; carbon, below 0.10. Annealing increases the permeability of such castings. On large-sized dynamo frames, where strength is an important factor, it is necessary to use higher carbon, silicon and manganese. J. W. RICHARDS.

Alloy Steels. BY W. METCALF. *Iron Age*, June 23, 1904 (read before American Society for Testing Materials).—A brief description of nickel steel, manganese steel, air-hardening manganese-tungsten steel, and a long account of modern high-speed steel. The latter has developed from manganese-tungsten steel, by reducing the manganese from 3 or 4 down or 0.30 per cent., increasing the tungsten from the usual 4 or 6 per cent. up to 10 or 20 per cent., keeping carbon below 1 per cent. Some of these steels have 2 to 6 per cent. of chromium, and others have their tungsten replaced in part or entirely by molybdenum. Many varieties are on the market, each suited best for one particular kind of work, and hardly any two receiving the same heat treatment. For very high speed work, it is necessary to fairly melt the point of a tool, quench it in a strong air-blast, and then grind to shape. It can be annealed as nicely as carbon steel. Dies, milling cutters, etc., are furnished from annealed bars, then heated in a lead-bath to 1800° to 2000° F., quenched quickly in ordinary tempering oil, then tempered in a bath of heavy oil heated to about 450° F. J. W. RICHARDS.

The Duty on Certain Ferro-alloys. *Iron Age*, June 16, 1904.—The custom-house has been admitting ferrochrome into the United States on payment of $4 per ton duty, on the grounds of its similarity to ferromanganese, while domestic manufacturers contend that it is not similar enough to ferromanganese either in material, quality, texture, or the use to which it may be applied, to be classed with it on the principle of analogy, and that it should be properly dutiable at 20 per cent. *ad valorem* as "metals unwrought," *i. e.*, metals now in the first stage in which they appear after reduction from the ore. The Board of General Appraisers have been sustained by the Circuit Court, and the question is to be appealed to the U. S. Supreme Court.

J. W. RICHARDS.

Smelting Iron by Electricity. *Iron and Mach. World*, May 28, 1904 (Extract from Report of Dr. E. Haanel to Canadian Minister of the Interior).—The commission appointed to study this subject abroad has made a preliminary report, from which it appears that at Gysinge, Sweden, the induction furnaces are making steel from pig-iron and scrap at the rate of four tons each per twenty-four hours, absorbing 0.116 horse-power year per ton of product. At La Praz, France, the Heroult furnace purifies pig iron, producing steel at a cost of $1.54 for power per ton of ingots produced. At Livet, Messrs. Keller, Leleux & Co. made tests for the commission by which it appeared that different grades of pig iron can be made electrically from iron ore with a consumption of one-third of a ton of coke and 0.226 horse-power year of electrical energy, per ton of pig iron made. The total cost of the pig iron at Livet was reckoned at $10.60.

J. W. RICHARDS.

Electrolytic Iron. BY C. F. BURGESS AND C. HAMBUECHEN. *Electrochemical Industry*, May, 1904 (read before the American Electrochemical Society).—After experimenting in many ways for over two years, very satisfactory results in refining iron have been obtained by using an electrolyte of ferrous and ammonium sulphates; current density at the cathode 6 to 10 amperes per square foot, at the anode slightly less; electromotive force slightly under 1 volt per cell; temperature about 30° C., anodes ordinary wrought iron or steel; starting sheets for cathodes of thin sheet-iron, cleaned from rust. The current efficiency is close to 100 per cent., *viz.*, 1 kilo of iron per kilowatt-hour. Cathodes have been obtained from four weeks' deposit, weighing 10 kilos apiece; solution keeps in good working condition. Cost would appear to be (aside from fixed charges and with power at $30 per kilo-watt year) under one-half cent per pound of iron. Purity is over 99.9 per cent., the only impurity being hydrogen, which is driven off by heating to redness. Containing hydrogen, it is hard and so brittle as to be readily pulverized. Dissolves in acids twelve times as quickly as iron wire, and is, therefore, very suitable for analytical standardizations. Pure iron is thus commercially obtainable as soon as there is a demand for it. In the discussion, it was pointed out that cast-iron was not available as an anode material, because of its impurity, quick disintegration and the excessive amount of anode scrap.

J. W. RICHARDS.

The World's Copper Production. BY H. R. MERTON & CO. *Eng. Min. J.*, May 19, 1904.—The careful estimate of this company makes the total production in 1903, in long tons, 565,820, an increase of 24,525 tons over 1902. The United States produced 298,650 tons or 53 per cent. of the whole; Spain and Portugal were next with 49,740 tons, or almost exactly one-sixth the output of the United States. The output increased in all countries except in Hungary, Germany, and Italy.

J. W. RICHARDS.

Lake Superior Copper Region in 1903. BY SPECIAL CORRESPONDENT. *Eng. Min. J.*, May 19, 1904.—The production of this region increased 22,718,182 pounds over 1902, to the largest total ever reached, 193,436,904 pounds. The Calumet and Hecla mines showed a decrease of 4,757,870 pounds, while the Champion, Mohawk, Baltic, Osceola, Adventure and Wolverine made up the principal increase. The increase for 1904 will probably reach 15,000,000 pounds; certainly 10,000,000.

J. W. RICHARDS.

Studies on the Siemen's Copper Process. BY M. DEK. THOMPSON, JR. *Electrochemical Industry*, June, 1904.—Experiments were first undertaken to determine the efficiency with which ferric sulphate dissolves various copper compounds; 100 cc. bottles were used, rotated in a thermostat at 80° C. With cupric oxide there is formed cupric sulphate and ferric oxide, when the reacting materials are present in equivalent quantities ($3CuO$ to $Fe_2(SO_4)_3$); when not in these proportions, basic salts form. Cupric sulphate is precipitated by cupric oxide; with equivalent amounts the precipitation is only partial; with large excess of oxide, complete. Under certain conditions, all iron and copper salts can be thrown out of solution. With cuprous oxide in the presence of free sulphuric acid there is formed cupric sulphate and ferrous sulphate, the reaction probably being in two steps, first the oxidation of half the copper to cupric oxide (the other half dissolving to cupric sulphate) and next the reaction of CuO with $FeSO_4$ to form $CuSO_4$ and FeO, which latter is precipitated in absence of free sulphuric acid. Neither cupric sulphate nor ferrous sulphate react on cuprous oxide. With cuprous sulphide, the commonly accepted equation, *i. e.*, the formation of $2CuSO_4$, $4FeSO_4$, and S, was verified quantitatively. It was further determined that neither $FeSO_4$ nor $CuSO_4$ solution has any action on Cu_2S, and that sulphuric acid dissolves it only very slowly, in presence of oxygen. With CuS the reaction forming $CuSO_4$, $2FeSO_4$ and S, was verified quantitatively; neither H_2SO_4, $CuSO_4$ or $FeSO_4$ act on it. Tests showed that Fe_2O_3 tends to precipitate iron from $Fe_2(SO_4)_3$ solution, forming basic sulphate. Precipitated sulphur is not oxidized by the ferric solution. The unused ferric sulphate may be reduced by sulphur dioxide in ordinary furnace gases, by passing the solution through a tower. Tests were made with a a chalcopyrite ore, roasted so that 7.6 per cent. of the ore was copper sulphate and 2.3 per cent. iron sulphate. Curves are given, showing the action of the solution on this material, as determined by analyses after one-fourth, one, two and six hours. The conclusion from numerous tests was that copper pyrites itself is not attacked by the ferric sulphate solution, but that roasting so changes it that nearly all the copper can be extracted, either by it or by sulphuric acid; the roasting changes the copper largely into oxide.

In electrolysis of the solution, a lead plate was used as anode, in sulphuric acid, while a solution of ferrous sulphate, cupric sulphate and sulphuric acid containing 3.5 per cent. copper was used in the cathode compartment. It was determined that the copper was deposited in spongy form when the percentage of copper in solution fell to 0.1 per cent., using 50 amperes per square meter, at 0.4 per cent. copper using 100 amperes, at 0.7 per cent. using 150 amperes, at 1.15 per cent. using 200 amperes, and at 3 per cent. copper using 250 amperes. For testing the oxidation during electrolysis, copper in copper sulphate was used in the cathode compartment and carbon rods in ferrous sulphate in the anode compartment. The amount of ferrous iron diffusing into the cathode compartment was determined and allowed for. Starting with an anode solution containing 5 per cent. of ferrous iron, tests showed this to be oxidized to ferric sulphate with 100 per cent. efficiency until the solution contained only 2 per cent. of ferrous iron, as long as the current density was kept between 30 and 50 amperes per square meter of anode surface, and was still at 90 per cent. efficiency when there remained 1 per cent. of ferrous iron.

J. W. RICHARDS.

The Economic Balance in Copper Refining. BY L. ADDICKS. *Electrochemical Industry*, May, 1904 (read before the American Electrochemical Society).–The problem has three essential variables —tank resistance, age of electrodes, and current density. Tank resistance can be lowered by using heavier conductors, but this is limited by the cost of the copper required; also by increasing the number of tanks abreast, but this is limited by increased labor cost due to inaccessibility and by the loss due to the increased number of tanks which have to be cut out of service when changing electrodes or removing slimes. A counter-electromotive force is due chiefly to difference in concentration at the electrodes, and no amount of circulation can totally obliterate it. High arsenic is the hardest impurity to handle, and the amount of copper in the bath must be sufficient to insure purity at the cathode at the voltages used. Free acid in the bath is limited by the percentage at which electrolysis of water commences, with resulting polarization. The temperature coefficient of the electrolyte is large, and a balance must be struck between power-saving, cost of heating, increased contact losses (due to increased corrosion by vapors) and increased cost of keeping the copper content down to the required amount. Much depends on whether the refiner is charged interest on the copper during refining. If he is, he will use a lighter anode and higher current density, and *vice versa*. A heavy anode reduces the percentage of scrap and the handling charges, and the heavier the average weight the better the contacts. The thinner the cathode sheets the higher the current efficiency. The higher the current density the lower the fixed charges per ton of output, and the lower the interest charges, but the higher the power cost, the rougher the deposit, the more active circulation required, the greater the silver losses in the cathode. The multiplicity of relations involved must be solved a pair at a time, and a set of final heats run off by the winners. In the discussion, the last statement was objected to by Prof. Bancroft, his point being that successive solutions of different parts of the problem, and a final combination of these did not give an accurate solution, which could only be obtained by attacking the whole problem, with all its various relations, at once.

J. W. RICHARDS.

The Phelps-Dodge Copper Interests. BY D. E. WOODBRIDGE. *Iron Age*, June 23, 1904.—A readable account of the Arizona copper districts. The new smelting plant of this company, at Douglas, 25 miles from the mines, has cost $2,500,000, and can smelt 1700 to 1900 tons of ore daily. It has five 42 x 204 inch furnaces, and barrel converters 9 x 10 feet. At Morenci there is a furnace 42 x 264 inches in horizontal section, and the matte is tapped directly from its forehearth into Bisbee converters. Gas engines to the extent of 1000 horse-power are here run on producer gas, consuming 1.3 pounds of coal per horse-power hour. The total output of the mines of this one company reaches 90,000,000 pounds of copper yearly. J. W. RICHARDS.

The Roasting Furnace Litigation. *Eng. Min. J.*, May 5, 1904.—The decision of Judges Sanborn and Thayer in the appeal of the Lanyon Zinc Company *versus* H. F. Brown, concerning the relations of the Brown, Ropp and Cappeau furnaces, has upheld the first claim of the Brown patent as valid. This claim is as follows: "In an ore-roasting furnace having means for stirring and advancing the ore, a supplemental chamber at the side of the main roasting chamber and cut off from said main chamber by a wall or partition and carriers in said supplemental chambers connected with the stirrers but removed from the direct action of the heat, fumes and dust, substantially as described." The decision of the court is that the Ropp furnace with its tunnel under the bed of the furnace, is an infringement of this claim; but that the Cappeau furnace with its entirely open hearth on posts, and carriers underneath, is not. The effect of this decision is practically that a roasting furnace with a supplemental chamber of any kind parallel with the hearth, infringes the Brown patent, but if the rabble arms project through a slot into an open space, as in the Cappeau furnace, there is no infringement. The decision will give a sharp impetus to the development of the latter class of roasting furnaces. J. W. RICHARDS.

Analysis and Rational Composition of Calcines. BY J. P. WALKER. *Eng. Min. J.*, June 9, 1904.—The author attempts to get the rational composition of the calcines from the McDougall furnaces, at the Butte copper works, by determining total Cu, total Fe, total S, SiO_2, Al_2O_3, FeO, Cu soluble in 20 per cent. H_2SO_4, SO_3 soluble in water. The assumptions are then made that the copper soluble in sulphuric acid represents Cu_2O, that not soluble in sulphuric acid represents Cu_2S, that the sulphur not present as Cu_2S or soluble sulphate is present as FeS_2, that the iron not present as FeO and FeS_2 is present as Fe_2O_3. This gives the rational composition in terms of insoluble matter, SiO_2, Al_2O_3, SO_3, Cu_2O, Cu_2S, FeO, Fe_2O_3 and FeS_2. Few will agree with Mr. Walker that undecomposed FeS_2 occurs in the calcines ; it should be rather Fe_7S_8, *i. e.*, magnetic pyrites.

J. W. RICHARDS.

Pyrite Smelting. A REVIEW BY E. D. PETERS. *Eng. Min. J.*, June 2, 9, 16, 1904.—The object of the review is to summarize the views of some ten prominent metallurgists who have answered the questions sent to them by Mr. T. A. Rickard, and which answers have been already printed *in extenso* in the *Engineering Mining Journal.* There is very little difference in the replies, furnishing more solid basis of information in regard to pyritic smelting than was ever before available. The following sums up Peters' review : Q. 1. *What types of ore are suited to the process ?* Q. 9. *What are the limitations of the process ?* Ans. Pre-supposing the presence of sulphides, any mixture of gold, silver or copper ores that will yield a fusible, and rather silicious, slag. Too much fines are a detriment, and the mixture must not contain too much zinc sulphide. Roasting and smelting may be more profitable with heavy pyrite and insufficient silicious ore. Q. 2. *Is hot blast advisable ?* Ans. Where there is a great abundance of iron sulphides in the charge, and a consequent ample generation of heat from their oxidation, the hot blast is advantageous but not indispensable ; where there is an earthy and silicious charge, with a moderate amount of pyrite, and where a high degree of concentration is desired, the hot blast is practically indispensable, for if the metallurgist uses more coke in such cases, the matte will be of low grade, and if he uses less his furnace will chill, whereas by using hot blast he gets the needed heat without increasing the proportion of coke used. Q. 3. *To what extent can fuel be eliminated ?* Ans. Assuming that other conditions are favorable, and that there is ample free silica in the ore, the metallurgist must keep carefully lessening the coke used until he reaches the degree of concentration desired. As the coke is decreased, the limestone must be decreased or the silica in the charge increased, to slag the increasing amount of ferrous oxide produced by the increased burning of sulphides. The proportion of coke used may be almost nothing in the case of heavy sulphide ores of favorable physical make-up, and where the ratio of concentration is not very high, and the amount of coke necessary increases as the proportion of sulphides diminishes, and also increases (within narrow limits) as the degree of concentration increases; even with high concentration and with quite a low proportion of sulphides, a marked saving in coke is effected by running the furnace pyritically. Q. 4. *What amount of copper is required for the collection of the precious metals?* Over half of the metallurgists answering say that 0.5 per cent. in the charge is sufficient to make a satisfactory collection of the gold and silver values under favorable conditions, *i. e.*, provided that the slag is not too heavy in iron or does not contain an excessive amount of zinc oxide. Under conditions very favorable for the separation of matte and slag, an iron matte alone, free from copper, will collect the precious metals, but under ordinary circumstances the beneficial effects of 0.5 per cent. of copper will be recognized. A continuation of this discussion will appear in later numbers of the *Engineering Mining Journal.* J. W. RICHARDS.

Magnetic Concentration of Zinc Ore in Virginia. BY C. Q. PAYNE. *Eng. Min. J.*, June 23, 1904.—In the spring of 1892, the Wythe Lead and Zinc Mine Co., at Austinville, Va., introduced a magnetic separator for the removal of limonite which had previously been rendered magnetic by a reducing roast. The ore is passed through a log washer, to take out the clay, then dried, crushed, mixed with 8 to 10 per cent. of coal slack, and roasted by hand-worked reverberatory furnaces until perfectly magnetic. A revolving cylinder roaster has been substituted for the reverberatories since 1901. The calcines are dumped on a brick cooling floor, sprinkled to hasten cooling, and then passed over Payne magnetic separators without sizing. These treat a sheet of ore 48 inches wide, and hence have large capacity.

J. W. RICHARDS.

Electrolytic Treatment of Zinc Sulphides. BY C. A. BURLEIGH. *Eng. Min. J.*, June 2, 1904.—Various mixed sulphide ores were treated by an alkaline solution, which was then electrolyzed, using 1.5 to 1.7 or 1.8 volts per cell, by which the lead only was deposited, 130 to 140 ampere hours giving a pound of lead. The solution was then passed to other cells, where voltages between 2.25 and 5.6 were applied, sometimes even 7 volts per cell, with current density of 8 up to 200 amperes per square foot, by which the zinc was deposited, 400 to 425 ampere hours giving a pound of zinc. As theory requires 375, the ampere efficiency was 88 to 93 per cent. Good results were obtained from ores carrying 12 to 59 per cent. of zinc, and 20 to 4 per cent. of lead. The solution was not vitiated by manganese or arsenic after several months' experimenting. J. W. RICHARDS.

The Hendryx Cyanide Process. By C. M. Fassett. *Eng. Min. J.*, May 5, 1904.—The ore is crushed, preferably in dilute cyanide solution, and run into the agitator, a cylindrical tank with a conical bottom of 45° pitch. In the center of the tank is a circular well, in which is a shaft carrying three screw propellers, which, when revolving, force the pulp up to the top of the tank and so keep the contents perfectly stirred. A coil of steam pipe allows of warming the contents. In the cylindrical part of the tank are anode and cathode plates supported from the sides and supplied with a gentle electric current, on which the gold going into solution is deposited. When the values are all extracted from ore and solution, the charge is run into settling tanks; the clear solution decanted from these is used over. The process requires only four to eight hours; slimes are advantageous rather than a hindrance. The expense is estimated at one-half that of the ordinary process. J. W. Richards.

Electrolytic Refining of Gold. By E. Wohlwill. *Electrochemical Industry*, June, 1904.—In an electrolyte of gold chloride which contains no other chloride, a pure gold anode, or an anode rich in gold, behaves like an anode of platinum or carbon; chlorine is developed in gaseous form, while the gold is not dissolved. The development of chlorine gas is prevented and gold is dissolved, if hydrochloric acid or certain other chlorides are added. With each such compound solution there exists a maximum of current density up to which gold is dissolved without evolution of chlorine gas; if this maximum is exceeded, chlorine is evolved. This maximum is increased by increasing the temperature or increasing the proportion of hydrochloric acid or foreign chlorides present. Pure platinum is not dissolved in any of these solutions which dissolve gold, but causes evolution of chlorine gas; if the platinum is alloyed with gold, however, it dissolves, but only gold is deposited at the cathode. Platinum thus accumulates in the solution until the concentration is high enough to permit its direct precipitation by ammonium chloride. Gold of 100 per cent. purity is thus obtainable from impure gold rich in platinum. In actual working, the bath is kept above 67° C., and hydrochloric acid is added until no free chlorine is evolved. The consumption of acid is only 2 per cent. of that used in the chemical method of separation; the power required is about 300 watt-hours per kilo of gold. The platinum obtained is absolutely free from iridium, because the latter is not dissolved from the anode; osmium-iridium also remains in the anode sludge. J. W. Richards.

The Electrolytic Refining of Gold Alloys. By E. Wohlwill. *Electrochemical Industry*, July, 1904.—The sulphuric acid parting of gold and silver never yields a complete purification of the gold, completely excludes the parting of platinum, and does not yield a complete recovery of silver, if platinum is present in large proportion. The electrolytic process avoids all these difficulties and disadvantages, but can be used only if the anode does not contain too much of such constituents which prevent the continuity of its solution; it should not contain, especially, too much silver and lead. If the bath is run at 50° or 55° C., it must not contain over 6 per cent. of silver plus lead. If the process is run at 65° to 70°, with high current density, and the chloride of silver is scraped off the anode plates at periodic intervals, alloys containing as much as 15 per cent. of silver may be treated. If alloy with a greater proportion than this is to be treated, it can be melted with nearly pure gold, as from the Moebius process, and so brought up to the required limit. Lead and bismuth must be counted in these limitations as so much silver. Gold, chemically dissolved, must be continually added to the solution, to make up for the difference between the quantity dissolved and that deposited. To supply this, some of the same alloy as is being treated is dissolved by acids, and the whole solution added to the bath. The purity of the precipitated gold is not diminished by a very large amount of copper in solution as long as the required absolute quantity of gold is present in the electrolyte. The thickness of the plates and the current density can be so arranged that of the total content of gold in the anodes 80 to 82 per cent. is recovered after twenty-four hours in the form of pure gold ready for sale or shipment, thus keeping interest charges within very reasonable bounds. J. W. RICHARDS.

ORGANIC CHEMISTRY.

The Molecular Rearrangement of Aminophenylalkyl Ca bonates. BY HENRY T. UPSON. *Am. Chem. J.*, **32**, 13–43.—Pa III (compare this Journal, **26**, R. 347). The aminophenylalky carbonates were prepared by treating an alkaline solution of th nitrophenol with ethyl chlorformate and then reducing the nitr group. When treated with water, the resulting ortho amines rearrange to oxyphenylurethanes. *p-Nitrophenyl methyl carbonat* is a white solid, m. p. 110°–112°, soluble in ether and alcohol. It can be reduced by stannous chloride and hydrochloric acid t the *chloride* of *p-aminophenyl methyl carbonate*, which is a whit solid showing no tendency to rearrange in aqueous solution *o-Nitrophenyl methyl carbonate* is a yellow mobile oil which, o reduction, gives the *chloride* of *o-aminophenyl methyl carbonate* the rearrangement of which has been discussed in a previou paper. A yield of 75 to 80 per cent. of pure *o-nitro-p-cresol* wa obtained by nitrating *p*-toluidine, diazotizing and distilling wit steam. The method is preferable to the direct nitration o *p*-cresol. *2-Nitro-4-methylphenyl ethyl carbonate*, $O_2\overset{2}{N}(\overset{4}{CH_3})C_6H_3.\overset{1}{O}.CO_2C_2H_5$, melts at 56°. *3-Methyl-6-oxyphenylurethane*, $\overset{3}{CH_3}(\overset{6}{OH})C_6H_3.\overset{1}{N}HCO_2C_2H_5$, results when the latter compound is reduced in alcoholic solution with tin and hydrochloric acid. It crystallizes in needles, m. p. 101°, and can also be prepared from the chloride of *o*-amino cresol and ethyl chlorformate. By careful reduction of the nitro carbonate at low temperature, the *amino carbonate* may be obtained. Its *chloride* melts with decomposition at 135°–137°; the *chlorplatinate* melts above 171° with blackening. An aqueous solution of the amine chloride on standing soon separates crystals of the oxyurethane. *Carbonyl-o-amino-p-cresol*, $\underbrace{\overset{1}{O}.C_6H_3(\overset{4}{CH_3})N\overset{2}{H}CO}$, is formed when the oxyurethane is heated above 110°. It crystallizes in needles, m. p. 128°. Some of this body is apt to be formed in the reduction of the nitro carbonate, if the temperature rises too high. *2-Nitro-5-methylphenyl ethyl carbonate*, from 2 nitro-*m*-cresol (m. p. 56°) and ethyl chlorformate, is a yellow oil which solidifies at —5°. *Chloride of 2-amino-5-methylphenyl ethyl carbonate* and its *chlorplatinate* were prepared from the nitro carbonate. The chloride readily rearranges to *4-methyl-6-oxyphenylurethane*, $\overset{4}{CH_3}(\overset{6}{OH})C_6H_3.\overset{1}{N}HCO_2C_2H_5$, m. p. 95°. *2-Nitro-6-methylphenyl ethyl carbonate*, from *o*-nitro-*o*-cresol (m. p. 70°), crystallizes in yellow needles, m. p. 32°–33°. *Chloride of 2-amino-6-methylphenyl ethyl carbonate* and its *chlorplatinate* were prepared. The chloride rearranges to *5-methyl-6-oxyphenylurethane*; white needles, m. p. 74°–76°. *4-Chlor-2-nitrophenyl ethyl carbonate*, from 4-chlor-2-nitrophenol, forms nearly white crystals, m. p. 60°. *Chloride of 4-chlor-2-aminophenyl ethyl carbonate*, $C_2H_5O_2\overset{1}{C}O(\overset{4}{Cl})C_6H_3\overset{2}{N}H_3Cl$, differs from the foregoing chlorides of amino carbonates in being insoluble in water. Its *chlorplatinate* forms yellow needles, decomposing somewhat at about 140°, and softening at 175°–180°. In presence of water, the chloride rearranges to *3-chlor-6-oxyphenylurethane*, m. p. 136°–137°. The same urethane may be obtained by the action of ethyl chlorformate upon 4-chlor-2-aminophenol. This urethane is unusually stable to heat and does not undergo much decomposition below 200°. Above this temperature, alcohol is split off and *carbonyl-4-chlor-2-aminophenol* formed. The latter crystallizes in white needles, m. p. 184°–185°. *6-Chlor-2-nitrophenyl ethyl carbonate*, from 6-chlor-2-nitrophenol, is an oil which does not solidify at —15°. *Chloride* of *6-chlor-2-aminophenyl ethyl carbonate* melts with decomposition at 126°–127°. It is insoluble in water, but in presence of it rearranges to *5-chlor-6-oxyphenylurethane*, which crystallizes in needles, m. p. 92°–93°. *4-Brom-2-nitrophenyl ethyl carbonate*, from 4-brom-2-nitrophenol (m. p. 88°), crystallizes from ether in large transparent plates, m. p. 76°. *Chloride* of *4-brom-2-aminophenyl ethyl carbonate* melts at 136°–137°. *3-Brom-6-oxyphenylurethane*, m. p. 140°–142°. In the chlorination of phenol it was discovered that considerable 2,4-dichlorphenol is formed. *4,6-Dichlor-2-nitrophenyl ethyl Carbonate*, m. p. 38°–39°. *Chloride of 4,6-dichlor-2-aminophenyl ethyl carbonate* melts with decomposition at 132°–135°, and is insoluble in water. *3,5-Dichlor-6-oxyphenylurethane* melts at 125°. It may also be prepared by the action of ethyl chlorformate on 4,6-dichlor-2-aminophenol. *4-Chlor-6-brom-2-nitrophenyl ethyl carbonate* forms yellow prisms, m. p. 48°–49.5°. *Chloride of 2-amino-4-chlor-6-bromphenyl ethyl carbonate* melts with decomposition at 131°–132°. *3-Chlor-5-brom-6-oxyphenylurethane*, m. p. 116°–118°. The presence of negative groups hastens the molecular rearrangement of the amino carbonate to urethane. *4-Brom-2-nitro-6-methylphenyl ethyl carbonate*, from 4-brom-2-nitro-2-cresol (m. p. 88°), melts at 61°–62°. *Chloride of 2-amino-4-brom-6-methylphenyl ethyl carbonate* darkens at 137°–143°, and melts with decomposition at 173°–178°. It is insoluble in water. *3-Brom-5-methyl-6-oxyphenylurethane* melts at 123°. The preparation of *2-nitro-6-brom-4-cresol* from the dibromcresol and sodium nitrite gives a better yield than the bromination of 2-nitro-4-cresol. *2-Nitro-4-methyl-6-bromphenyl ethyl carbonate*, from 2-nitro-6-brom-4-cresol (m. p. 69°), melts at 84°–85°. *Chloride of 2-amino-4-methyl-6-bromphenyl ethyl carbonate* melts with decomposition at 142°–143° and is insoluble in water. *3-Methyl-5-brom-6-oxyphenylurethane* melts at 83°. *Part IV. 4-Chlor-2-nitrophenyl acetate* was prepared from 4-chlor-2-nitrophenol, acetic anhydride and fused sodium acetate. It melts at 47°–48°. By careful reduction with tin and hydrochloric acid at low temperature, the *chloride* of *4-chlor-2-aminophenyl acetate* was obtained as a white solid, m. p. 105°–107°. Its *chlorplatinate* darkens at 120° and does not melt at 200°. The *free base* forms white needles, m. p. 73°–74°, which become reddish on standing in the air, and readily rearrange to *acetyl-2-amino-4-chlorphenol*, $CH_3COOC_6H_3(Cl)NH_2 \rightarrow HOC_6H_3(Cl)NHCOCH_3$. Acetyl-2-amino-4-chlorphenol was also obtained by the direct acetylation of 2-amino-4-chlorphenol. It is crystalline and melts at 176°. *Ethenyl-4-chlor-2-aminophenol*, $CH_3.\overline{C : N.C_6H_3(Cl)O}$, is produced by the dry distillation of the foregoing. It forms white needles, m. p. 53°–54°, and of a peculiar, but pleasant odor. Its *chloride* melts at 129°–130.5°, and readily loses its hydrochloric acid on standing. Its *chlorplatinate* does not darken or melt at 220°; covered with water and rubbed up, it turns white with evident decomposition. It is clear, therefore, that *o*-aminophenyl acetate should be obtained as the first product of the reduction of the nitro acetate. The failure of Hübner, Stünkel, Böttcher and others to obtain the amine was probably due to operating at too high temperatures. M. T. BOGERT.

The Action of Hydrogen Peroxide upon Anhydrides and the Formation of Organic Acid Peroxides and Peracids. BY A. M. CLOVER AND A. C. HOUGHTON. *Am. Chem. J.*, 32, 43–68.—In considering the action of hydrogen peroxide upon benzoyl acetyl oxide, Nef assumes that the following reaction occurs $C_6H_5CO.O.COCH_3 + H_2O_2 = C_6H_5CO.O.O.COCH_3 + H_2O$. In attempting to prepare other peroxides by the action of hydrogen peroxide upon anhydrides, it was found that only those anhydrides which are acted upon by water react with hydrogen peroxide, the reaction in the two cases being quite similar and the formation of the acid peroxide depending upon two distinct reactions. When an anhydride is dissolved in aqueous hydrogen peroxide, the following are the chief changes likely to occur: (1) Ordinary hydrolysis with water; (2) analogous reaction with hydrogen peroxide, resulting in the formation of a peracid; (3) action of peracid on anhydride with formation of acid peroxide; (4) ordinary hydrolysis of peroxide with water; (5) action of hydrogen peroxide upon acid peroxide with formation of two molecules of peracid and also with loss of oxygen, possibly due to intermediary formation of a derivative of hydrogen trioxide; (6) slow hydrolysis of peracid to acid and hydrogen peroxide; (7) slow decomposition of both peracid and hydrogen peroxide with evolution of oxygen. *Changes in Acetic Peroxide when Dissolved in an Aqueous Solution of Hydrogen Peroxide.*—Hydrogen peroxide, acetic peroxide, and acetic peracid can be estimated in presence of each other. In dilute solutions containing no mineral acid, hydrogen peroxide and acetic peroxide act upon potassium iodide so slowly that acetic peracid may be determined by rapid titration with potassium iodide and thiosulphate. Hydrogen peroxide may be titrated direct with potassium permanganate in a dilute solution strongly acidified. Acetic peroxide is then estimated by difference after determining the total active oxygen. A solution of hydrogen peroxide containing 30.5 grams per liter was nearly saturated with pure acetic peroxide, and portions of the solution analyzed from time to time. At the end of two hours the amount of active oxygen in the solution as peracid was just half that originally present as peroxide. The formation of peracid was, therefore, much faster than in aqueous solution. The amount of hydrogen peroxide in the solution rapidly decreased, and the solution gradually lost in total active oxygen, but the loss of the former was much greater than of the latter. At each interval the total active oxygen present as peroxide and peracid was considerably greater than that originally present as peroxide. Acetic peracid was, therefore, formed at the expense of the active oxygen of the hydrogen peroxide. During the later stages of the reaction the peracid was decomposed faster than it was formed. The action of hydrogen peroxide upon acetic peroxide gives more peracid than would be formed by ordinary hydrolysis, and may be explained as follows: $(CH_3COO)_2 + (OH)_2 = 2CH_3.COOOH$. *Action of an Aqueous Solution of Hydrogen Peroxide upon Acetic Anhydride.*—When acetic anhydride is dissolved in hydrogen peroxide solution, both acetic peracid and peroxide are soon present in the solution. A study of the rates of formation of these two substances shows that the peracid is first produced, probably according to the following equation: $(CH_3.CO)_2O + HOOH = CH_3.COOOH + CH_3.COOH$. The peracid then reacts with unchanged anhydride to form acetic peroxide. Since acetic peroxide changes almost completely into acetic peracid in the course of twenty-four hours, a solution of the peracid may be prepared by allowing a solution of the anhydride in hydrogen peroxide to stand for this length of time. In one case, the yield of peracid thus obtained amounted to 45 per cent. of the theory. The rate of reaction of hydrogen peroxide with anhydride is much greater than that of water with anhydride. Propionic anhydride shows the same general behavior as acetic, but its action is slower since it is less soluble. *Anhydrides of Dibasic Acids. Succinic Peroxide Acid,* $(HOOC.CH_2.CH_2.COO—)_2$, is formed by the action of excess of succinic anhydride upon a strong solution of hydrogen peroxide. The first product of the reaction is probably succinic monoperacid, which then reacts with unchanged succinic anhydride. The peroxide acid crystallizes in flat irregular plates, which begin to soften at 115° and melt completely at 128° with decomposition. When brought into a flame it explodes, but does not explode on percussion or friction. It is colorless and odorless, and slowly deteriorates in the open air. It is moderately soluble in water, alcohol, acetone, and acetic ether, sparingly in ether, insoluble in chloroform, benzene and ligroin. In contradistinction to most other peroxides, this peroxide acid liberates iodine from potassium iodide almost immediately, so that the peracid and peroxide cannot be separately determined as with the monobasic acids. Heated in boiling xylene, most of it is decomposed with formation of succinic anhydride and a gummy acid substance. A portion is converted into adipic acid, apparently as follows:

$$HOOC.(CH_2)_2\boxed{COO.OOC}(CH_2)_2.COOH = HOOC.(CH_2)_4.COOH + 2CO_2.$$

Succinic Monoperacid, $HOOC.CH_2.CH_2.COOOH$, was obtained by the hydrolysis of the above peroxide acid. From a mixture of chloroform and ether, it may be obtained in large crystals. It is much more soluble in water than succinic acid, dissolves freely in alcohol, acetone, and acetic ether, is only moderately soluble in ether and sparingly in chloroform; has little, if any, odor, and gradually decomposes on standing. When a strong aqueous solution of the compound is saturated with succinic anhydride, a heavy precipitate of succinic peroxide acid soon separates. By the action of heat upon the monoperacid, it splits off first carbon dioxide, then water, with formation of acrylic acid. *Succinic Glutaric Peroxide Acid*, $HOOC.(CH_2)_2COO.OCO(CH_2)_3COOH$, from succinic monoperacid and glutaric anhydride, begins to soften at 105°, and melts with decomposition at 107°. Its oxidizing action is less powerful than that of succinic peroxide acid. *Glutaric Peroxide Acid*, from glutaric anhydride and hydrogen peroxide, melts sharply at 108° with decomposition. When heated in boiling xylene, only a small amount of suberic acid was formed. M. T. BOGERT.

On Inulin. BY ARTHER L. DEAN. *Am. Chem. J.*, **32**, 69–84. —The author finds that inulin is present in the roots of the burdock and of the goldenrods. With but one exception (the stem of the artichoke) no inulin could be found in the aerial parts of those plants containing inulin in their underground parts. From his own results, and the investigations of others, the author comes to the following conclusions: (1) Inulin obtained from the underground storage organs of *Dahlia variabilis*, *Helianthus tuberosus*, *Lappa minor*, *Inula helenium*, and *Solidago* shows no essential difference and may be looked upon as the same. (2) Inulin is accompanied in these places by levulins, resembling inulin in composition, but being more soluble and of a lower specific rotation. (3) The line of division between inulin and the levulins is apparently a very difficult one to draw; the physiological significance of such a division is somewhat problematical. (4) The first method of separating these substances devised by Tanret is extremely tedious and of doubtful value. The second method, although rather long, is readily applied, but apparently involves loss of material, and does not yield preparations having the properties of inulin as given by the author of the process. (5) Tanret claims to have isolated and determined the properties of the various levulins, but the author's experience renders him skeptical of the reliability of Tanret's results. (6) The inulins and levulins are probably polymeric ($=(C_6H_{10}O_5)_x$ or $(C_6H_{10}O_5H_2O)_x$), the inulins, being less soluble and of higher rotatory power, having the greater molecular weight. M. T. BOGERT.

AGRICULTURAL CHEMISTRY.

Experiments with Sugar Beets in 1903. BY C. D. SMITH. *Mich. Agr. Expt. Sta. Bull., No.* **215**, 19 pp.—Sugar-beets grown from the same seed under identical conditions, were found to vary greatly in sugar content. The difference in adjacent beets was frequently over 2 per cent., and in one instance over 3 per cent. Estimating the average sugar content of a plat from the analysis of every fifth beet, made a difference of over 1 per cent. as compared with an estimate based upon the analysis of every sixth beet. It is, therefore, believed to be unsafe to estimate the amount of sugar in a field of beets from the analysis of 10 or 20 samples taken either at random or systematically. Sugar-beets sent by mail to the station lost sufficient in weight to make an increase in the sugar content of 3 to 4½ per cent., indicating that it is not safe to estimate the sugar content of a field of beets by tests made in a distant laboratory, unless the beets are carefully weighed when taken from the ground. The sugar content of beets is said to depend upon the season, the amount of sunshine, the soil, and the seed; and to be but little under the control of the farmer. Beets grown from the same lot of seed in different localities in the state showed considerable variations in sugar content. Growing three crops of beets in succession on the same soil was shown to be exceedingly injurious, as compared with growing beets in rotation with other crops. Experiments indicated that phosphoric acid, potash, and nitrogen may be applied profitably in the culture of sugar-beets on nearly all Michigan soils, and that nitrates are always in demand, even on the richest soils. H. W. LAWSON.

The Influence of Current Electricity on Plant Growth. BY G. E. STONE. *Mass. Agr. Expt. Sta. Rep.*, 1904, pp. 13-30.—Experiments in stimulating lettuce and radish plants with electricity are reported. The conclusions drawn as to the influence of electricity are based in part upon these results, but also upon much additional work which has been in progress at the station for a number of years. Lettuce and radish plants were favorably influenced by electricity in all instances except two. The best results were obtained where an attempt was made to maintain the strength of current within narrow limits. In the hundreds of experiments conducted at the station, positive results have almost invariably been obtained as regards the stimulating effect of electricity on the germination of seeds and the growth of plants. The alternating current has been much superior to the direct current. Various theories concerning the stimulating influence of electricity are briefly reviewed. The author believes that the influence is exerted on the protoplasm of the plant rather than on the soil. When seeds were treated with a positive charge the growth of the roots was accelerated more than that of the stems. The results were reversed when the seeds were subjected to the influence of a negative charge. Positive charges appeared to produce attenuated root development. A further report on investigations along other lines of this subject is promised. H. W. LAWSON.

The Influence of the Atmospheric Electrical Potential on Plants. By N. F. Monahan. *Mass. Agr. Expt. Sta. Rep.*, 1904, pp. 31-36.—Preliminary experiments are reported, from which the conclusion is drawn that atmospheric electricity exerts an appreciable influence upon the germination of seeds and the growth of plants. Electricity accelerated germination, but did not increase the total germination over that of uncharged seeds. As regards the influence on plant-growth, the author believes that there is a maximum, an optimum, and a minimum potential, and that these depend upon the kind of plant and the size, degree of development, etc., of the individual. H. W. Lawson.

Adulterated Linseed Oil for Veterinary Purposes. By P. Schweitzer. *Mo. Agr. Expt. Sta. Rep.*, 1903, pp. 27-28.—An oil sold for linseed, was found to be a boiled oil containing lead, 18 per cent. of naphtha, 6 to 10 per cent. of resin oil, and probably other oils besides linseed. The material caused the death of cattle to which it had been administered as a medicine.
H. W. Lawson.

Investigation of Canned Food Products. By P. Schweitzer. *Mo. Agr. Expt. Sta. Rep.*, 1903, pp. 28-31.—Nearly all of the thirty-eight brands of canned fruits and vegetables examined were found to contain preservatives. H. W. Lawson.

Some Food Products and Their Adulteration. By H. G. Knight and R. B. Moudy. *Wyo. Agr. Expt. Sta. Bull., No.* **62**, 55 pp.—Since the food law went into effect in September, 1903, 425 samples of food products have been examined, of which 268 were found to be adulterated or misbranded. The results of the work are reported in detail. H. W. Lawson.

The Associative Action of Bacteria in the Souring of Milk and in Other Milk Fermentations. By C. E. Marshall. *Mich. Agr. Expt. Sta., Special Bull., Nos.* **23**, 8 pp.; **29**, 7 pp.—In these two bulletins are reported the results and experiments with a species of peptonizing bacteria and a species of lactic acid bacteria. When inoculated simultaneously, the two species caused the curdling of milk from forty-eight to seventy-two hours earlier than when the lactic acid bacteria were inoculated alone. While the peptonizing bacteria rendered milk alkaline when grown alone, it increased the development of acidity when grown in the presence of the lactic acid bacteria; and this influence is believed to be due to the products of the peptonizing bacteria, rather than to the bacteria themselves. H. W. Lawson.

Reports of the Chemists. By J. B. Lindsey and C. A. Goessmann. *Mass. Agr. Expt. Sta. Rep.*, 1904, pp. 37-104.—The chemical work at the station during the year is outlined, digestion and feeding experiments are reported, and analyses of miscellaneous materials are included. The composition of milk and butter was shown to be influenced by the food of the cows. Corn oil increased the fat content of milk, but decreased the percentage of nitrogen. It also lowered the saponification number ten points and the Reichert-Meissl number 3½ points, and increased the iodine number 9 points without changing the melting-point. The proportion of the milk constituents and the character of the butter-fat are not believed to be changed by the proteids or carbohydrates when these are fed in normal amounts.

H. W. LAWSON.

Reports of the Chemists. BY R. HARCOURT AND W. P. GAMBLE. *Ontario Agr. Coll. and Expt. Farm. Rep.*, 1903, pp. 37-57.—Several lines of investigation are briefly summarized in these reports. A swamp soil, rich in vegetable matter, was found by analysis to be deficient in potash. Pot experiments showed that the inoculation of this soil with nitrifying organisms gave better results than the addition of potash. The nitrogen in the form of gliadin in wheat grown in 1902 was 48.5 per cent., while in 1901 it was 62.7 to 67.3 per cent. of the total nitrogen. Analyses of insecticides, sugar-beets, and various by-products used as feeding-stuffs are reported, and a brief summary is given of previously published work concerning the chemical changes taking place in cheese during the process of ripening.

H. W. LAWSON.

Report of the Chemist. BY F. T. SHUTT. *Can. Expt. Farms Rep.*, *1903*, pp. 127–161.—Various subjects were investigated during the year. A continuation of a study of the conservation of moisture in orchard soils emphasized again the great value of cultivation and the preservation of an earth mulch for arresting the drying-out of soils, and also the necessity of the early plowing-under of cover crops in districts where drought is likely to prevail. Analyses were made of various field crops, feeding-stuffs, fertilizers, fungicides, insecticides, well waters, etc., the number of samples aggregating 699. The results of experiments showed the desirability of storing honey in a warm, dry atmosphere. Beeswax adulterated with paraffin was met with.

H. W. LAWSON.

PATENTS.

MARCH, 1 1904.

753,267. John F. Huefner, New York, N. Y. Making a **salve**. Olive oil 70, cocoa butter, and liquefied beef marrow, 15 parts each, are mixed and cooled to 12° F. to form a finely crystallized body.

753,290-1. George F. and James W. McIndoe, Boston, Mass. ssignors of one-third to Arthur E. Whitney, Winchester, Mass. **ylindrical intaglio printing forms** to reproduce textile rfaces. A sensitive coating is applied to the surface of a iitable metal cylinder, a fabric is selected and saturated with lutinous material, dried under heat and pressure on a sup- orting bed with an elastic surface. The fabric is coated with dense printers' ink, thus getting a thin coating impervious to ght, which figured design is transferred to the cylinder, then xposing the coated cylinder to light whereby the coating is ndered insoluble in water in parts, washing the cylinder and rying it, etching the ground and removing the rest of the coat- ig. The second patent covers the use of a press for transferring ie coating.

753,294-5-6. Paul Naef, New York, N. Y. Making **gas**. Water as and by-products are obtained by injecting steam into a mov- ig body of bituminous fuel, withdrawing the reaction products, heating them and passing them through another portion of said ioving body of fuel. The last number is for the apparatus, con- sting of a series of vertical conical cylindrical retorts with the wer ends conical, either side by side or one over the other, and iitable connecting pipes to cause the gas to traverse successively ie entire series.

753,310. Weston A. Price, Cleveland, Ohio. **Compound paque to X-rays.** Red lead 10, glue and glycerol 1 part each, iolasses ½ and rubber $^1/_{10}$ part by weight. The molasses may e substituted by turpentine, glycerol, etc.

753,325. Albert W. Smith, Cleveland, Ohio. Making **chloro- rm.** Sulphur is combined with hot carbon to make CS_2, on hich sulphur chloride is caused to react to form CCl_4; this is frac- onally distilled with sulphur and sulphur chloride, and then ibjected to the action of water and a metal as iron filings alone r with a trace of acid.

753,372. Anatole Denguine and Samuel Levinsohn, Geneva, witzerland. **Condensation products.** Dicarbon acids and romated phthalic acids are melted with naphthols in the presence f boric acid, the product being treated with sulphuric acid to orm bromated oxynaphtacenquinone.

753,383. Oskar Frank, Detroit, Mich. **Storage battery plates.** Lead electrodes are immersed in an electrolyte of water 95 per cent., and sodium sulphate 5 per cent. with 0.7 per cent. of $KClO_3$, then passing a current of one ampere for fifty hours at a temperature of 20° C.; then put the positive plates in weak sulphuric acid, making them negative and sheets of lead positive, connect up and charge with two amperes for fifty hours, remove, wash and dry at 300° C., all hydrochloric acid being removed by washing in distilled water.

753,385. Henry A. Gerdes, Minneapolis, Minn. Assignor to F. W. Cappelen, Arthur H. Elftmann, and James B. Cull, same place. **Maturing Portland cement.** The blocks are heated to 360° F. and exposed to a current of air charged with carbon dioxide and moisture.

753,407. Wm. Lenderoth, New York, N. Y. **Artificial stone.** Shale 78 and serpentine rock 22, are fused and molded. May be treated like glass.

753,610. John G. McDowell, Pittsburg, Pa. **Coating pipes.** Iron pipe is first pickled in a solution of niter cake or salt cake, with free acid, a hot blast of air or steam is passed through it and it is then coated with enamel.

753,657. Oscar Bally, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. **Anthracene dye.** One part of a mixture of crude α- and β-anilido anthraquinone monosulpho acid is made to react on 12 parts of bromine and the product treated with ammonia. The dye is soluble in water brown-violet, not affected by caustic or carbonate of soda, but turns brown on treatment with sulphuric acid. Dyes chrome mordanted wool gray-blue to blue-black.

753,659. Rene Bohn, Mannheim, Germany. Assignor to Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine, Germany. **Anthracene derivative.** Indanthrene is treated with a mixture of nitric and hydrochloric acid, giving a yellow-brown substance insoluble in water and yielding chlorindanthrene by the action of reducing agents.

753,716. George I. Leonard, Pasadena, Cal. **Carbon resistance.** A suitable non-conducting base is coated with a paint of plumbago and glue or other binding agent, and then rubbing the coating till it is reduced to the required resistance.

753,746. Chris. N. Smith, Elgin, Ill. Assignor to David C. Cook Publishing Co. **Preparing color plates.** A yielding plastic coat of wax is applied to a suitable plate and smoothed off, the coating is removed from those parts which are not to appear in color and a screen pressed on the wax to stipple fine or coarse as desired. The plate is then electrotyped, as usual, my invention being in the preparation of the plate for the color work.

753,822. Edward C. Broadwell, Chicago, Ill. **Extracting gold.** Pulverized ore is mixed with an alkaline earth hypochlorite solution, to which copper sulphate has been added.

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753,875. Gustave Gin, Paris, France. **Electric manufacture of iron alloys.** Silicic acid, an alkaline sulphate and carbon are heated in an electric furnace, making an alkaline silicate which is introduced into a second furnace, and iron oxide and carbon added thereto, then heating the mixture to make ferrosilicate and an alkaline oxide, the latter of which is sublimed.

753,977. Adolph A. Gurtner, Berne, Switzerland. **Photographic plate.** There are two plates with films superposed, one film orthochromatic and containing silver bromide and the other plate provided with an orange-colored film containing silver chloride, the latter stained with aniline orange and directed toward the object in exposure. The plates are separated and developed.

753,994. Hudson Maxim, New York, N. Y. **Smokeless powder.** A plastic smokeless powder is softened by a solvent as acetone and molded into rods or strips, multiperforating them affixing a combustible non-explosive covering as paper or celluloid over the whole surface. The powder is made of a mixture of guncotton and nitroglycerin.

754,054. Matthew H. Devey, Philadelphia, Pa. **Anti-fouling composition.** Ground glass is bolted and run through sieves of 24, 26, and 28 mesh to the inch respectively. Five pounds of each size are taken and mixed with Portland cement 20, copper sulphate 6, Venice turpentine 2, linseed oil 7, and litharge $^1/_5$ pounds.

754,114. George J. Atkins, Tottenham. Preparing **electrodes.** To prevent disintegration the electrode is saturated with an oxidizable oil mixed with carbon such as linseed or cottonseed oil and lampblack.

754,141. Evan H. Hopkins, South Kensington, London, England. Obtaining **zinc.** Lead is added to the ore and the mass heated, the vapors being condensed in a mass of carbon under which the liquid zinc is collected, all being done with exclusion of air.

754,147. Josef Von Kowalski and Ignaz Moscicki, Freiburg, Switzerland. **Electrical production of nitrogen compounds** as nitric acid. The primary and secondary winding of a transformer are connected with the alternating current, and a plurality of consumption branches arranged in groups between the leads of the transformer, a condenser and inductance coil in each consumption branch, a group inductance coil in series with each group of branches, and a main inductance coil arranged between the leads and in parallel with the consumption branches, and a receiver inclosing each pair of electrodes. Thirty-three horsepower of electric energy make 1155 grams of nitric acid per hour from the air.

754,154. Otto Massenez, Wiesbaden, Germany. Making **steel.** Chromiferous pig iron is melted in a reverberatory furnace, forming in contact therewith such a quantity of slag capable of dissolving chromic oxide, the resulting chromiferous slag not containing more than 14 per cent. of chromic oxide, adding repeatedly fluor spar and removing a part of the slag after each addition, and finally separating the whole of the slag.

754,159. John A. Potter, New York, N. Y. **Treating ores.** The operation is carried out in a rocking furnace with cavities in each end, which are charged with ore, etc.; one is brought to fusion and the contents poured over the material in the other cavity by rocking the furnace, and this operation is repeated alternately, tapping out the surplus from time to time.

754,164. Robert N. Riddle, Uwchland, Pa. Assignor to Warner Chemical Co., Carteret, N. J. **Vanillin.** Acet-isoeugenol is dissolved in the ester of a fatty acid as amyl acetate, then oxidized by a chromic acid solution and the resulting acetyl vanillin compound decomposed for vanillin.

754,262. Frederick C. Weber, Chicago, Ill. **Improving iron.** The iron or steel is melted and a soluble metallic binary boride, as ferrotitanium boride, is added, which decomposes by heat, the titanium alloying the iron and the boron forming a fusible slag with the impurities of the iron.

754,264. Heinrich Weltz, Ludwigshafen-on-Rhine. Assignor to Badische Anilin und Soda Fabrik, same place. **Anthracene dye.** Anthraquinone monosulpho acid is treated with concentrated sulphuric acid and mercury in the presence of phosphoric and nitric acids, and to the resulting purpurin sulpho acid an aromatic amino compound is added. The dye dissolves in concentrated sulphuric acid violet that becomes blue on adding boric acid, caustic soda changes the aqueous solution blue to violet, that on adding ammonia becomes redder, and it dyes chrome mordanted wool black.

754,265. John A. Wendel, Milwaukee, Wis. **Match composition.** Potassium bichromate 3, vegetable carbon and amorphous phosphorus 5 each, antimony, sulphide and lead nitrate 10 each and potassium chlorate 20 parts.

754,298. George Fry, Berwick-on-Tweed, England. Production of **resinous substances.** Resin or linseed oil is treated with 10 to 30 parts nitric acid (sp. gr. 1.420) at a temperature of 212° F. and the compounds finished by heating over a water-bath, making a resin suitable for varnish, etc.

754,301. Robert A. Hadfield, Sheffield, England. **Hardening steel.** The articles are cast of nickel-chromium steel, the internal temperature raised to 900° C. and a current of air directed on the article.

754,315. Paul Julius and Ernst Fussenegger, Ludwigshafen-on-Rhine. Assignors to Badische Anilin und Soda Fabrik, same place. **Azo dye.** A *p*-diazomonoalkyl phenylnitrosamine is combined with 1-8-dihydroxynaphthalene-3-6-disulpho acid and the product saponified. By reduction the constituents are regenerated and the dye colors violet-red to blue.

754,340. Ferdinando Pasarelli, New York, N. Y. **Preserving fruit.** The fruit is treated with lime-water and dried ; it is then packed, the air exhausted from the container and carbon dioxide supplied thereto, and when carbon dioxide has replaced all the air the container is sealed.

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754,417. Philip J. Brahen, Hartford, Conn. Assignor to American Restoring Co., same place. **Stone-cleaning composition.** Sodium chloride 1 and sodium carbonate 16 parts are dissolved in boiling water, 66⅔ parts, and poured over a mixture of 4 parts whiting and 12 of chloride of lime.

754,461. Anton V. Kouba, Milligan, Neb. **Fermenting honey.** A beverage is made by mixing honey and water to 21° on the saccharimeter, boiling, skimming and slowly adding to each hundred gallon 40 pounds of chalk, later 50 pounds animal charcoal, running into a tank to cool and settle, and adding a mixture of vine yeast 15, ammonium phosphate 6, ammonium tartrate 15, potassium bitartrate 25, tartaric acid 11 and magnesium sulphate 6, all in ounces. The whole is then allowed to ferment.

754,474. Hermann Mehner, Steglitz, near Berlin, Germany. **Nitrogen compounds from the atmosphere.** A vertical furnace is provided with two charging hoppers : from one a stream of broken carbon or coke, from the other melted alkaline silicate goes down the furnace while a stream of air is forced up through the carbon, and the volatile cyanogen compounds are separated and collected.

754,566. Paul L. Hulin, Clavaux, par Rioperoux, France. Sodium is melted in a closed vessel partially filled, the space containing carbon dioxide or nitrogen compressed to high pressure and the vessel being provided with a jet tube to deliver the sodium under the surface of melted metal, etc.

754,588. Thomas Mellor, Philadelphia, Pa. **Bleaching compound.** Linseed oil 100, benzene 6, petroleum 19, turpentine 19, chloroform 12, glycerol 6, alcohol 100, potassium hydroxide 25, ammonium carbonate 25, and gelatine 11 parts.

754,643. Karl Danziger, Zawodze near Kattowitz, Germany. **Separating iron pyrites from zinc blende.** The zinc ore is oxidized by air, moisture and heat, and the ferrous salt washed out by water.

754,647. Willis E. Everette, Tacoma, Wash. Making **cyanides and nitrates.** Pulverized carbonaceous material is strongly cooled by contact with liquid air, then suddenly brought in contact with incandescent material, producing violent chemical action, and the cyanides, etc., are separated and collected.

754,667. Walter Mills, London, England. Assignor to A. O. Granger, Cartersville, Ga. Making **lead salts.** Concentrated hydrofluosilicic acid is mixed with lead-carrying material, the lead fluosilicate formed is treated with nitric acid to make lead nitrate, and this in turn is acted on by the acid required to make any desired salt as sulphuric acid.

754,668. As above for **ammonium nitrate.** The lead nitrate of the above process is treated with ammonium fluoride, forming lead fluoride and ammonium nitrate.

754,768. Edouard Hepp, Frankfort-on-Main, and Ernst Wolpert, Hochst-on-Main, Germany. Assignors to Farbwerke, vorm Meister Lucius und Bruning. **Anthraquinone dye.** 1-4-5-8-leucotetrahydroxy anthraquinone is treated with sulfanilic acid, forming a dark powder soluble in water and ammonia, and dyeing wool a fast blue.

754,782. Max Lichtenberger, New York, N. Y. Assignor to Louis Wertheimer, same place. **Dyed sawdust.** Wood sawdust is ground, bleached and dyed with aniline color.

754,803. Swigel Posternak, Mendon, France. **Organic compound of phosphorus.** Oil cake is treated with dilute alkali and mineral acid, the extract filtered off and mixed with a solution of copper sulphate, calcium chloride, sodium acetate and hydroxide to precipitate a phosphorus double compound of alkaline earths and heavy metals; said salts are then suspended in water and acted on by hydrogen sulphide to precipitate the heavy metal, then evaporated, leaving a white powder, soluble in water and containing more than 20 per cent. by weight of phosphorus.

754,824. Howard Spence, Manchester, England. **Aluminum sulphate.** Hot sulphuric acid is applied to an excess of alumina under pressure, and the product treated with milk of lime till the desired basicity is obtained, filtering, evaporating and crystallizing out the basic sulphate.

754,856. August Dorrer, Ludwigshafen-on-Rhine, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Red-violet azo dye.** The diazo derivative of 1-5 naphthylamine sulpho acid is combined with 1-8 naphthalene diamine, giving a dye soluble in sulphuric acid blue, in water red-violet, on reduction by ammonia and zinc dust yields 1-4 naphthylamine sulpho acid and 1-8-4-triamino naphthalene.

754,868. John A. Heany, Philadelphia, Pa. Assignor to Teter-Heany Developing Co., Charleston, West Va. **Fire-proof coating.** Piles are first coated with glue, then a mixture of glue and asbestos is applied to which resin may be added, then an outer coat of kaolin 6, alumina 2, and calcium sulphide 4 parts by weight.

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754,978. Charles A. Doremus, New York, N. Y. **Hydrofluoric acid.** Hydrofluosilicic acid is treated with an excess of a metallic compound as bauxite or kaolin, forming a fluoride which is heated to redness and acted on by superheated steam, thereby giving hydrofluoric acid.

755,132. Jewett A. Henkel, Bedford City, Va. **Cleaning millstones.** Runs common salt through with the stock to remove hardened gum.

755,144. Valentine Lapp, Lindenau, near Leipzig, Germany. **Steeping grain** to hasten germination. The grain is immersed in a closed vessel of water at 12° C. for four hours; the wet grain is then transferred to the action of liquid air for one hour, repeating the treatment and finishing with water at 15° C.

755,201. John F. White, Buffalo, N. Y. Assignor to General Chemical Co., same place. Making **sodium sulphide.** Niter cake is heated in the presence of coal and salt.

755,222. Ernst W. Engels, Dusseldorf, Germany. **Lining for lead furnaces.** Twenty-five to 90 per cent. of carborundum is mixed with 10 to 75 per cent. of clay, the mixture being used to line the furnaces with, whereby injury to the walls is prevented.

755,225. Bogdan Gisevius, Berlin, Germany. **Photographing printing plates.** A metal plate is coated with chromated gum, exposed and developed, then coated with chromated albumen, hardened, covered with an acid resist, etched in an acid bath and the acid resist removed to leave an albumen printing surface.

755,240. William Powell, Liverpool, England. **Vulcanizing wood.** The wood is boiled in sugar syrup, then treated with hot, dry air, so as to solidify and caramelize the sugar.

755,247. Pedro G. Salom, Philadelphia, Pa. **Sulphuric acid.** A series of vessels shaped like a conical frustum are set one in the other, and half-filled with water, forming electrolytic cells, which communicate with each other so as to pass a current of sulphurous acid gas through the series and oxidize it to sulphuric acid by electrolytic action.

755,278. Wm. Y. Cruikshank, Freeland, Pa. Assignor one-half to Dixon Maley, same place. **Artificial fuel.** Anthracite coal culm and dry powdered resin are mixed with an asphalt-rendered fluid by a volatile solvent as benzine, and the whole subjected to heat and pressure to drive off the water and the solvent.

755,302. Ernest A. Le Sueur, Ottawa, Canada. Obtaining **copper.** Material containing copper is treated with ammonia containing a copper compound, and a part of the copper contents of the solution are removed so that the solution is used over again, and kept at about the same strength.

755,357. Robert A. Cheesebrough, New York, N. Y. **Composition for laying dust** on roads. Porous clay is impregnated with petroleum, 20–25 per cent.

755,372. Joseph Koeniger, Cologne, Germany. **Ore bricks for smelting.** Ore dust or other residues in a dry condition are mixed with lime, magnesia and borax, the whole moistened with crude dilute sulphuric acid, and pressed and molded.

755,378-9. Walter Mills, London, England. Assignor to A. O. Granger, Cartersville, Ga. The first for **nitric acid,** the second for **fluorides and silicates.** Lead-carrying substances are dissolved in hydrofluosilicic acid, the lead salt acted on by a nitrate, which is decomposed by sulphuric acid to liberate nitric acid. In the second patent, the lead silicofluoride is mixed with sand and heated to form the desired silicate. Without sand, silicon tetrafluoride is made.

755,390. Georges Reynaud, Paris, France. **Achroödextrin from peat.** Peat is mixed with twice its weight of water and heated to 160° to 220° C. for two hours under pressure in a digester.

755,415. Wm. Trantom, New Brighton, England. **Purifying brine.** To an alkaline chloride solution add a sulphate of the same alkali in amount equivalent to the calcium and magnesium contained in the brine, then add lime to precipitate the magnesia as a hydroxide, then add barium carbonate equal to the sulphates present, and finally regenerating the barium carbonate from the sulphate for re-use.

755,417. Jan Vilim, Prague, Austria-Hungary and Friedrich Hauser, Naefels, Switzerland. Hauser, assignor to Vilim. **Photographic half-tones.** Half-tone plates are coated with sensitive asphalt dissolved in a mixture of benzene, ether and alcohol 2 to 3, and chloroform 5 to 10 parts, and the solvents evaporated in a moist atmosphere. For fine grain, use the most chloroform.

755,428. Julius Abel, Mannheim, and Arthur Luttringhaus, Ludwigshafen. Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. **Blue sulphur dye.** A mixture of thiazine as methylene violet and phenol is heated with sulphur and sodium sulphide to 142° C.; dissolve the melt in boiling water, oxidize by air-blast, and salt out. When cold, filter, press and dry.

755,461. James D. Darling, Philadelphia, Pa. **Alloys.** A bath of copper is melted, and a mixture of iron oxide and calcium carbide added to form an alloy of iron and copper.

755,479. Robert Goldschmidt, Tajkovitz, and Jan Hasek, Smitchov, Austria-Hungary. Making **starch.** Potatoes are ground to a pulp, soda-lye or sulphurous acid added to prevent fermentation, the mass centrifugated to separate the solid and liquid parts; the solids are dried and ground and the starch separated dry by shaking separators.

755,519. George T. Moore, Washington, D. C. Preparing for distribution of **nitrogen-fixing bacteria.** A water solution is made of agar-agar and maltose 1 per cent. each, and magnesium sulphate 0.02–0.05 per cent. and potassium phosphate 0.1 per cent.; in this the nitrifying bacteria are cultivated, and when developed in satisfactory numbers the solution is taken up by absorbent cotton and dried for transportation and use by the farmer. (This patent is taken out under section 4886 R. S. exceptions, according to which any person may use the same without royalty.)

755,557. Robert H. Aiken, Jerome, Ariz. **Converting matte.** The matte in a converter is subjected to an oxidizing blast, and the hot flux is fed into the converter about as fast as it is used.

755,562. Charles H. Burckett and Mary M. Burckett, Glenridge, N. J. **Cocoa confection.** The cocoa beans are pressed, heated and stirred to break down the starch cells, then digested with a ferment to saccharize the starch, and finally the butter first extracted and an emulsifying agent added, such as malt extract.

755,589. Montgomery Waddell, New York, N. Y. Composition for **razor strop.** Cocoa butter and finely divided aluminum.

755,598. Adolf Savelsberg, Ramsbeck, Germany. **Desulphurizing lead ores.** Pulverized galena and limestone are mixed and heated to a point just below the melting-point of the ore, making calcium sulphate by the combustion of sulphur and liberating carbon dioxide; afterward the mixture is filled into a chamber and a current of air blown through.

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755,629. Leonard D. Davis, Erie, Pa. Process of **annealing steel.** The steel is immersed in a bath of melted aluminum at 1200° to 1500° F. and gradually cooled.

755,653. Frederick E. Grimm, Utica, N. Y. **Match composition.** Glue and zinc oxide 35 each, ground glass 65, gum benzoin 10, amorphous phosphorus 20, flowers of sulphur 5, lead hyposulphite 15, and potassium chlorate 115 parts by weight.

755,705. Herman G. Schanche, Philadelphia, Pa. Assignor to Harrison Bros., same place. **Absorption apparatus.** A rectangular vessel with staggered inclined flow boards, and feed- and delivery-pipes. Adapted to make sulphurous acid.

755,722. George Stroh, Syracuse, N. Y. Making **castings.** Aluminum is melted over a body of heavier metal of lower melting-point, the mold being inverted over the melting pot and the aluminum being forced upwards into the mold by pressure applied to the heavy metal.

755,763. Wm. Gilmour and Alexander Lindsay. **Hardening cast iron.** The metal is heated and dipped in a bath of 1 gallon of strong sulphuric acid and ¾ pound of red arsenic.

755,801. Robert E. Schmidt, Elberfeld, and Paul Tust, Vohwinkel, Germany. Assignors to Elberfeld Co., New York, N. Y. **α-Hydroxyanthraquinone.** Anthraquinone monosulphonic acid is heated with calcium hydroxide and water to about 190° C., then hydrochloric acid added to separate the α-hydroxyanthraquinone.

755,808. Frank T. F. Stevenson, Detroit, Mich. **Sulpho-iodine compound of hydrocarbons.** An odorless light brown powder, slightly soluble in concentrated alkalies, and absolute alcohol, soluble in ether, collodion, chloroform and fixed oils, insoluble in water, derived from a hydrocarbon derivative containing hydroxyl as pyrocatechin, resorcinol or hydroquinone, etc., having its hydrogen substituted by iodine and its oxygen by sulphur.

755,826. Robert S. Woodson, Boulder, Colo. **Welding compound.** Borax about 5 and silicon dioxide about 95 per cent.

755,843. Joseph H. Campbell, New York, N. Y. **Artificial butter substitute.** Skim milk is concentrated by a blast of hot air, the original amount of cream added, and the whole concentrated to a butter consistency, at a non-sterilizing temperature.

755,951. Joseph Smith, San Francisco, Cal. **Treating ores.** The ferrous oxide is rendered insoluble in the cyanide solution by applying heat to the moist crushed ore first before putting it in the cyanide solution.

755,983. Robert W. Wood, Madison, Wis. **Color photograph.** Separate negatives of the object are taken through red, green and blue screens; from these negatives positives are made on glass, covered with a sensitizing solution, and upon each positive is photographed a diffraction grating adapted to give its appropriate color and developing the plate.

WILLIAM H. SEAMAN.

REVIEW OF AMERICAN CHEMICAL RESEARCH.

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INORGANIC CHEMISTRY.

The Action of Halogen Acids upon Vanadic Acid. BY F. A. GOOCH AND R. W. CURTIS. *Am. J. Sci.* [4], **17**, 41–48.—The reduction of vanadic acid by means of hydrochloric, hydrobromic or hydriodic acid tends, in each case, to reach a state of equilibrium. The degree to which the vanadic acid is reduced depends upon the concentrations. It has been shown that hydrochloric acid is capable of carrying the reduction, even in the cold, to the condition of the tetroxide, and under none of the conditions tried does the reduction go further. Diluted hydrobromic acid gives a definite reduction to the tetroxide, but, when concentrated, reduces a large proportion to the trioxide. The reduction by means of hydriodic acid may be carried to either stage according to the concentration.
H. N. MCCOY.

Trisulphoxyarsenic Acid. BY L. W. MCCAY. *Proc. Am. Phil. Soc.*, **43**, 112–115.—The magnesium salt of trisulphoxyarsenic acid is formed by the action of magnesium oxide on freshly prepared arsenic pentasulphide, suspended in water. The sodium salt $Na_3AsOS_3 + 11H_2O$ is obtained as feathery crystals by adding sodium hydroxide, filtering and adding alcohol. Yield good. The following salts were also obtained: $K_3AsOS_3 + 7H_2O$; $NaSrAsOS_3 + H_2O$; $KBaAsOS_3 + 7H_2O$. A brief summary of further work is given, without experimental detail.
H. N. MCCOY.

The Constitution of Hydrous Thallic Chloride. BY F. M. MCCLENAHAN. *Am. J. Sci.*, **18**, 104–112 (see this Rev., **26**, 332).—The dehydration of hydrous thallic chloride, $TlCl_3.4H_2O$, when heated in dry air and in dry hydrogen chloride was studied in order to throw light upon the constitution of the salt. By the passage of dry air at 100° over the salt for an hour nearly anhydrous crystalline, thallic chloride was obtained. There was also a small loss of chlorine, amounting to about 1 per cent. of the entire amount contained in the original salt. The salt $TlCl_3.2H_2O$ was obtained by dehydrating over calcium chloride. Portions of the dihydrate were heated at 100°, and the loss of weight noted at intervals of fifteen minutes. The first molecule of water is lost in fifteen minutes, and the second molecule and a little chlorine in the course of one and one-half to two hours. When the tetrahydrate is heated in dry hydrogen chloride, the latter is absorbed at all temperatures below 100°. Below 50° the loss of water, in an atmosphere of hydrogen chloride, is small. Chlorthallic acid, $TlCl_3.3H_2O.HCl$, is probably formed at 60°–70°. At 80° $TlCl_3.H_2O.HCl$ may be formed. At 120° anhydrous $TlCl_3$, slightly reduced to thallous-thallic chloride, is left. The author thinks the behavior indicates the correctness of Cushman's graphic formula for the tetrahydrate. H. N. McCoy.

Some Double Salts of Lead. By John White. *Am. Chem. J.*, 31, 1–24.—Lead iodide was dissolved in a hot concentrated solution of sodium acetate in 80 per cent. alcohol containing a little acetic acid. White, flat, orthorhombic plates, obtained from this solution, had the composition $PbNaI(C_2H_3O_2)_2\frac{1}{2}C_2H_4O_2$. Another salt, $PbNa_3I(C_2H_3O_3)_4\frac{1}{2}C_2H_4O_2$, thin, pearly white scales, was also obtained. The following double salts were obtained in a similar manner: $PbK(C_2H_3O_2)_2$, pearly white leaflets, m. p. 208°; $PbNH_4I(C_2H_4O_2)_2$, white crystals; $Pb_2I(C_2H_3O_2)_3\frac{1}{2}C_2H_4O_2$, monoclinic prisms. All of these double salts are decomposed by the action of water, yielding first lead iodide. In the course of several days the lead iodide, first formed acts further on the solution, the final product being PbI(OH). The potassium salt is not decomposed by 98 per cent. alcohol. Under the same conditions the ammonium salt is slowly decomposed, and the sodium salt readily decomposed. H. N. McCoy.

The Inclusion and Occlusion of Solvent by Crystals. By T. W. Richards. *Ztschr. phys. Chem.*, 46, 189–196; this Rev., 25, 432; *Proc. Am. Phil. Soc.*, 42, 28–36. H. N. McCoy.

The Specific Gravities of Cadmium Chloride and Cadmium Bromide. By G. P. Baxter and M. A. Hines. *Am. Chem. J.*, 31, 220–228.—The recent investigations of T. W. Richards upon atomic volume have made it desirable to obtain the densities of certain salts with great accuracy. In all of the processes of preparation of the substances studied, the details of which are fully given, very great care was used to obtain products of the highest degree of purity. A special form of pycnometer was employed, with purified toluene as the liquid, in the determinations of the specific gravities. The substances were found to be insoluble in toluene. Five determinations of the density of fused cadmium chloride gave values from 4.044 to 4.054 ; mean, 4.049 at 25°/4°. Two determinations of the density of fused cadmium bromide each gave 5.196. A sample of very pure silver bromide gave, as a mean of four determinations, 6.478. H. N. McCoy.

The Specific Gravity of Zinc Chloride. By G. P. Baxter and A. B. Lamb. *Am. Chem. J.*, **31**, 229–235.—As in the work described in the preceding paper the greatest care was used to insure a high degree of purity of the salt. The final process consisted in the ignition of dry $ZnCl_2.3NH_4Cl$ in a current of dry hydrogen chloride. The residual fused salt was entirely free from oxychloride and from ammonia. Five determinations of the density, using the method described in the preceding paper, gave a mean of 2.907. H. N. McCoy.

The Rare Elements. By Victor Lenher. *Electrochemical Industry*, **2**, 11–13 and 61–63.—The article gives a concise view of our present knowledge of the rare elements.
H. N. McCoy.

The Elements: Verified and Unverified. By Charles Baskerville. *Science*, **19**, 88–100.—(Address of the vice-president and chairman of Section C, Chemistry, of the American Association for the Advancement of Science, St. Louis meeting, December 28, 1903). Although no new experimental results are presented, the paper contains many highly interesting suggestions, and numerous references to the literature of the subject.
H. N. McCoy.

Action of Ultra-Violet Light upon Rare Earth Oxides. By Charles Baskerville. *Am. J. Sci.* [4], **16**, 465, 466.—The oxides of the elements Gd, La, Nd, Pr, Ce, Sa, Th, Yt, Er, U, Yb, Ti and Zr were subjected to the action of ultra-violet light. Only two of the earths responded at all, namely, zirconium and thorium dioxides, which phosphoresced strongly. The zirconium oxide was not radioactive. A number of minerals, containing these two elements, were tested in a similar manner, but none were found to be either fluorescent or phosphorescent.
H. N. McCoy.

Radioactivity. By E. A. Partridge and R. H. Bradbury. *J. Franklin Inst.*, **156**, 321–334.—The paper consists of a review of the literature of the subject of radioactivity.
H. N. McCoy.

Radioactivity of Thorium Minerals. By G. F. Barker. *Am. J. Sci.* [4], **16**, 161–168 (read before Natural Academy of Science).—Samples of monazite sand from Brazil and from North Carolina, each free from uranium, were found to be radioactive. Pure thoria made from each sample was also active. Other sam-

ples of pure thorium compounds were examined, but in no case was an inactive substance found. The literature of the subject is critically reviewed and it is concluded that it is not probable that the activity of thorium is a secondary or excited radioactivity due to the uranium associated with it in the minerals above mentioned.
H. N. McCoy.

Inactive Thorium. By Fritz Zerban. *J. Elisha Mitchell Sci. Soc.*, **20**, 57–62.—Thorium was extracted from a number of minerals. That derived from minerals containing the largest amount of uranium was the most highly radioactive. After several months the activity of the highly active preparations had decreased to about that of uranium. Thorium obtained from minerals containing no uranium had not over one-seventh the normal activity. The author thinks that thorium itself is inactive, and that it derives its activity from uranium, radium or some other active substance. H. N. McCoy.

Radium in an American Ore. By A. H. Phillips. *Proc. Am. Phil. Soc.*, **43**, 157–160.—Twenty-five pounds of carnatite from Utah were treated successively with hydrochloric and nitric acids. To the solution was added a little barium chloride and then sulphuric acid. The precipitate, so obtained, yielded half a gram of crude barium radium chloride of 1500 activity, and 2 grams of chlorides of 365 activity. The activity of these samples had not decreased after seventeen months. H. N. McCoy.

On the Ratio of Radium to Uranium in Some Minerals. By B. B. Boltwood. *Am. J. Sci.*, **18**, 97–103.—This is a more detailed report of the article *Eng. Min. J.*, May 12, 1904; This Review, **26**, 334. In the eight specimens of minerals examined, the ratio of radium to uranium is apparently constant within the limit of error of the experiments. H. N. McCoy.

On Polonium and the Inducing Character of Radium. By F. Giesel. *Sci. Am. Sup.*, **56**, 23,123.—The article is an abstract of the three papers, *Ber. d. chem. Ges.*, **35**, 3608; **36**, 342, 729.
H. N. McCoy.

Notes on Platinum and Its Deterioration. By W. Campbell. *Electrochemical Industry*, July, 1904.—A summary of the literature of deterioration of platinum, and effect of heating and strain on its microstructure. concluding with experiments of the author. A thermo-couple of platinum-platinum—10 per cent. rhodium suddenly becomes brittle when used above 1050° C., showing a change when recalibrated. Under the microscope, the platinum wire, which had been within a fire-clay tube, showed numerous large grains or crystals, well accounting for its brittleness. Where the wires had been exposed to gases, a curious incrustation on the surface completely hides the crystallization and causes a great thickening of the wire, due to the absorption and subsequent evolution of gases. Contact with the gaseous products of combustion is thus one cause of deterioration, but a reducing atmosphere in the presence of silicious material causes the greatest alteration. J. W. RICHARDS.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

Observations on the Geology and Geography of Western Mexico Including an Account of the Cerro Mercado. BY O. C. FARRINGTON. *Publications Field Columbian Museum, 11*, 195–228; map, plates, figures.—The results of fragmentary observations made in portions of Durango in 1896. Little new knowledge is afforded as to the origin or manner of formation of the remarkable hill of iron ore near the city of Durango, called Cerro Mercado. The unusual relation between a body of iron ore and associated acid igneous rocks is still unexplained. The octahedral crystals of martite which are found in the ore, with the iron almost wholly ferric, are described and an analysis is given. In connection with the last the final clause of the following sentence had better have been omitted. "The presence [in the martite] of pyrite is indicated by the content of sulphur and an almost exact equivalent of FeO." The finding of ferrous iron in an analysis is anything but evidence of pyrite. Prismatic crystals of apatite are described. Three analyses of rhyolites, two of them (liparose and dellenose) associated with the iron ore and one (lassenose) from the Ciudad de Rocas on the trail to Ventanas, are also given, accompanied by descriptions of the rocks. All original analyses are by H. W. Nichols of the Field Museum.

W. F. HILLEBRAND.

Superficial Blackening and Discoloration of Rocks, Especially in Desert Regions. BY WILLIAM P. BLAKE. *Trans. Am. Inst. Min. Eng.* (Advance Extra, Lake Superior Meeting), September, 1904, 5 pp.—The prevailing black color of most rocky outcrops in the desert regions of the southwestern portion of the United States, a phenomenon which has been noted elsewhere by others, is generally extremely superficial, although so strongly marked as to often mask completely the normal appearance of the rock. Even white quartz is thus affected. The film consists of oxides of iron or manganese or both, and its formation is ascribed to "an osmotic flow, a kind of rock transpiration tending upwards and outward to supply the excessive evaporation under hot arid conditions," whereby ferrous salts become changed under the sun's hot rays to the insoluble ferric form. Where the rocks themselves contained insufficient iron to account for the coating, as in the case of quartz pebbles lying on the surface of the soil with only the exposed portion discolored, the flow is assumed to have been from the earth to the pebbles. The phenomenon is in principle closely allied to the formation of caliche (see this Journal, **24**, R. 5).

W. F. HILLEBRAND.

Origin of the Magnetic Iron-Ores of Iron County, Utah. By E. P. JENNINGS. *Trans. A. I. M. E.* (Advance Extra, Atlantic City Meeting), February, 1904, 5 pp.—These deposits, rivaling in extent those of Lake Superior and destined to be of great commercial importance, consist of magnetite and hematite. They carry traces of copper, but no titanium. The merchantable grades average as follows:

	Fe. Per cent.	P. Per cent.	S. Per cent.	Cu. Per cent.
Magnetites..........	62–68	0.01–0.48	0.007–0.03	0.002–0.08
Hematites...........	40–61	0.03–0.40	0.01 –0.10	0.003–0.09

The magnetite occurs in nearly vertical dikes in diorite-porphyry and also as overflows from these dikes. The dikes, when not concealed by sheets, form bold black outcrops of massive mineral devoid of any crystallization except in vugs and joints. Silica, as quartz and chalcedony, and apatite are the chief impurities, the latter in slender crystals up to six inches in length. When intruded between porphyry and limestone, the magnetite sheets have become converted into soft and earthy hematite. The author regards the magnetic ores as the "result of an extremely basic differentiation from a basaltic magma in the deep," and that they have been forced in the molten state up through fissures, and is convinced that they are not segregations in place. While the field evidence is strongly in favor of an eruptive origin, microscopic evidence of the diorite-porphyry wall rock is equally antagonistic to it, by reason of the presence of considerable quartz in the form of infiltrations. W. F. HILLEBRAND.

Copper Ore and Garnet in Association. BY WILLIAM P. BLAKE. *Trans. A. I. M. E.* (Advance Extra, New York Meeting) October, 1903, 5 pp.—The paper draws attention to the wide distribution of garnet as an associate of copper ore, and several new instances of such occurrence in the southwestern portion of the United States are noted. The conditions there justify the conclusion that the garnet is not the result of simple contact metamorphism in place, but that its silica was derived from silicious emanations traversing limestone. "The general presence of copper sulphides in these garnet-reefs, together with an excess of silica, shown by the presence of quartz, gives the garnet-reefs a lode-like character, the garnet becoming a true veinstone or gangue for the copper ore."

W. F. HILLEBRAND.

The Copper Deposits of the Encampment District, Wyoming. BY ARTHUR C. SPENCER. *U. S. Geol. Survey, Professional Paper, No. 25*, 107 pp.; maps, figures.—Development of the ore bodies has not been great enough to afford a large fund of information regarding the occurrence of the copper minerals and their relations to the enclosing rocks. The originals of the dark intrusives which occur in all parts of the region were gabbro, norite, and olivine-norite or peridotite. Of these, only the norite has been found unaltered. From the fact that Dr. E. T. Allen found traces of copper in all of the eighteen specimens of these rocks that were examined, "the dark-colored gabbro rocks . . . are regarded as the original source of a large part of the copper which occurs in the ores." Copper was found in even the freshest rocks, free from chalcopyrite, but the microscope failed to reveal identifiable copper minerals. The silicious igneous rocks of the region are, with exception of a few unimportant dikes, older than those above noted. Traces of copper were found in some specimens of a quartz-diorite, but not in all. The types of ore bodies are: Those due to regional metamorphism and contact impregnation, both in hornblende schists, and those due to circulating waters in all classes of rock. Copper is the predominant metal of value, with subordinate gold, silver, and lead. The copper minerals are chalcopyrite, bornite, chalcocite, covellite, malachite, azurite, chrysocolla, and cuprite. Copper also occurs in pyrrhotite, usually with a little nickel or cobalt. Of the above minerals, chalcopyrite and pyrrhotite are primary. The gangue minerals are quartz, calcite, siderite, feldspar, hornblende, epidote, and garnet. Though veins occur, usually composed of quartz or calcite or both, sometimes with siderite, the metallic minerals ordinarily permeate the rocks. Several of the ore bodies seem certainly to be the result of secondary enrichment. The copper minerals are widely distributed in small segregations in a variety of rocks, but large deposits are rare. Analyses by Dr. E. T. Allen appear, showing the composition of norite, diorite derived from norite, diorite probably derived from gabbro, and diorite derived from norite by metamorphism. W. F. HILLEBRAND.

Zinc and Lead Deposits of Northern Arkansas. BY GEORGE I. ADAMS. *U. S. Geol. Survey Professional Paper No. 24*, 118 pp.; maps, plates.—In the preparation of this report the author has been assisted by A. H. Purdue and E. F. Burchard, and there is a section on the "Determination and Correlation of Formations," by E. O. Ulrich. The author discusses briefly the origin and formation of the different classes of sulphide and oxidized ores, without advancing anything new of interest to the chemist. He entertains views differing in certain respects from those advanced by previous writers as to the immediate source of the metals and the movement of the ore-bearing waters. "Ore deposition in the Ozark region and in the Mississippi Valley in general, although controlled by the same general principles, has occurred under varying conditions, and it seems reasonable to expect that, while there are in the various districts many similarities, there should likewise be important differences, and, accordingly, no general theory can be offered for the entire area. Thus far the northern Arkansas district appears to warrant consideration as a distinct field, as it is not a counterpart of any district which has been described." W. F. HILLEBRAND.

Description of the Edgemont Quadrangle. BY N. H. DARTON AND W. S. TANGIER SMITH. This is the descriptive text accompanying the *Edgemont Folio of the Geological Atlas of the United States*, issued by the Geological Survey.—The quadrangle, chiefly in South Dakota, includes the area between parallels 43° and 43° 30′ and meridians 103° 30′ and 104°. The text is illustrated by a few analyses: Of the Minnekahta limestone, a typical gypsum from south of Hot Springs, and waters from Cascade Creek and an artesian well at Argentine.

W. F. HILLEBRAND.

Orbicular Gabbro-Diorite from Davie County, North Carolina. BY THOMAS LEONARD WATSON. *J. Geol.*, **12**, 294–303; figures.—The occurrence of this rock suggests that of a dike in a gray porphyritic biotite granite. It shows orbicular or nodular and granitic facies. In the former the nodules are far in excess of the matrix, which is largely composed of feldspar and very subordinate amounts of other minerals. The nodules are dark, and with few exceptions are made up almost entirely of diallage and hornblende. Their structure is radial, and from microscopic evidence it appears to have resulted from magmatic differentiation. W. F. HILLEBRAND.

On the Pyroxenites of the Grenville Series in Ottawa County, Canada. BY C. H. GORDON. *J. Geol.*, **12**, 316–325; figures.—The author concludes from his studies, made in the vicinity of High Rock, about 40 miles north of Ottawa: "1. That these pyroxenic rocks of Ottawa County were intruded into the overlying sedimentary beds at considerable depths, and solidified originally as a coarse-grained pyroxenite consisting chiefly of augite, but approaching the gabbro end of the series. 2. That, through the changes effected by pressure and metasomatic processes, whereby original structures have in large part disappeared, the rock should now be classed with the pyroxenite gneisses. 3. That the apatite deposits associated with these rocks were due to fumarolic action at the time of the intrusion of the pyroxenites, and also, to a greater extent possibly, to that attending the later intrusions of syenite." W. F. HILLEBRAND.

Eclogites in California. BY RULIFF S. HOLWAY. *J. Geol.*, **12**, 344–358; figures. Detailed descriptions are given of eclogites from several localities in California and reference to one in

Oregon. Some are regarded as derived from basic eruptives of the gabbro type. Only one variety was analyzed (by C. B. Allen) from San Martin, southeast of San José, with the following result: SiO_2, 44.15; Al_2O_3, 10.18; Fe_2O_3, 11.92; FeO, 13.04; MgO, 6.18; CaO, 4.51; Na_2O, 5.11; K_2O, 2.09; H_2O above and below 110°, 0.95; TiO_2, trace. Total, 99.31.

W. F. HILLEBRAND.

The Production of Asbestos in 1903. BY J. H. PRATT. *Extract from Mineral Resources of the United States in 1903,* 15 pp.—This report contains, in addition to the usual statistics, interesting information as to new localities, the origin of chrysotile asbestos, and the uses for the mineral. W. F. HILLEBRAND.

The Production of Iron Ores in 1903. BY JOHN BIRKINBINE. *Extract from Mineral Resources of the United States in 1903,* 37 pp.—There appear, besides statistics of production, the usual numerous analyses of cargoes of Lake Superior ores.

W. F. HILLEBRAND.

The Production of Lithia. BY J. H. PRATT. *Extract from Mineral Resources of the United States in 1903,* 7 pp.—One analysis each of amblygonite and lepidolite from Pala, San Diego County, California, made by R. L. Seldner, appear in this report, both of which seem to be new but are not altogether complete.

W. F. HILLEBRAND.

The Production of Borax in 1903. BY CHARLES G. YALE. *Extract from Mineral Resources of the United States in 1903,* 16 pp.—At the conclusion of this report is described the Blumenberg sulphur dioxide process in operation at Daggett, California.

W. F. HILLEBRAND.

The Underground Waters of Gila Valley, Arizona. BY WILLIS T. LEE. *U. S. Geol. Survey, Water Supply and Irrigation Paper No.* 104, 71 pp; plates and figures.—Analytical data concerning several underground waters are given.

W. F. HILLEBRAND.

A Geological Reconnaissance across the Bitterroot Range and Clear Water Mountains in Montana and Idaho. BY WALDEMAR LINDGREN. *U. S. Geol. Survey, Professional Paper No.* 27, 123 pp; maps, plates, figures.—As implied in the title, no detailed investigations are herein recorded, and the new analyses are restricted to one each of quartz-monzonite, from near the head of Mill Creek, Bitterroot Range, Montana, and a lignite of fair quality from near the head of the South Fork of Bitterroot River.

W. F. HILLEBRAND.

Analyses of West Virginia Natural Gas. BY C. D. HOWARD. *West Virginia Geol. Survey, Vol. IA,* pp. 553–556.—This report forms a small but important part of Chapter V, "The Composition of Natural Gas," in the volume cited, the greater part of the chapter being devoted to a reprint of Prof. F. C. Phillips's paper in the Ann. Rep. Second Geol. Survey of Penn., 1886, on "The Chemical Composition of Natural Gas." The chief difference in composition between the gases analyzed by Phillips and those from West Virginia lies in the markedly lower percentage of nitrogen, found in the latter. The analyses are said to have been made with care and the methods followed are briefly indicated.

ANALYSES MADE IN JUNE, 1904. PERCENTAGES BY VOLUME.

	1.	2.	3.	4.	5.	6.
CO_2	0.006	0.1	0.0	0.0	0.1	0.0
CO	0.4	0.4	0.4	0.4	0.4	0.5
O	0.2	0.2	0.2	0.1	0.3	0.3
H	trace	0.2	0.0	0.1	0.1	0.0
Heavy hydrocarbons	0.4	0.2	0.4	0.2	0.1	0.2
C_2H_6	14.60	14.09	15.09	14.88	14.35	7.65
CH_4	80.94	81.60	79.95	80.85	80.70	86.48
N	3.46	3.21	3.96	3.47	3.95	4.87
H_2O (grains in 100 cu. ft.)	17.72	....	....	....	....	....
Total S (grains in 100 cu. ft.)	0.182	....	....	....	....	....
B.T.U. per cu. ft calculated	1142.6	1136.9	1140.9	1143.6	1131.4	1065.3

NH_3, CS_2, H_2S, absent from all.

No. 1—Morgantown supply (Big Injun Sand), Monongalia and Greene (Pa.) Counties.
No. 2—Fairmont supply (Bayard sand), Marion County.
No. 3—Big Injun Sand gas from Lucas Brothers well No. 1, one mile and a fourth northwest of Shinnston. Top of sand 1421 feet below Pittsburg coal.
No. 4—Gordon sand gas (Shinnston supply) from J. B. Cunningham well No. 1, three and one-half miles northwest of Shinnston, Harrison County. Top of sand 2199 feet below Pittsburg coal.
No. 5—Fifth sand gas from Harbert well No. 1, near West Fork river, and three-fourths mile due east of Lumberport, Harrison County. Top of sand 2380 feet below the Pittsburg coal.
No. 6—"Fifty-Foot" sand gas from Lucas Brothers well No. 4, one mile west of Shinnston, near mouth of Robinson run, Harrison County. Top of sand 1855 feet below the Pittsburg coal.

W. F. HILLEBRAND.

The Graydon Sandstone and Its Mineral Waters. BY E. N. BABCOCK AND JESSIE MINOR. *Bulletin of the Bradley Geol. Field Station of Drury College* (*Missouri*), *Vol. I*, *Part I*, pp. 22–31.—In this paper, analyses by the authors appear of the waters of the Twin and Cary Springs, two of the six issuing at Graydon Springs, all of which are chalybeate, differing in this respect from the limestone springs of the region. The springs at Graydon, Eudora, and other places have been regarded as sulphur springs from their pronounced odor, but the authors failed to find hydrogen sulphide in them and ascribe the odor to minute quantities of petroleum. W. F. HILLEBRAND.

Geology under the Planetesimal Hypothesis of Earth-origin. BY HERMAN LEROY FAIRCHILD. *Bull. Geol. Soc. Am.*, *Vol.* 15, pp. 243–266.—This paper first appeared in the *Am. Geologist*, 33, 94 (this Journal, **26**, R. 154), but there is appended in the present case the discussion resulting from its reading before the Geological Society of America. Of those taking part Mr. Willis T. Lee presented the following observation: Two dikes of scoriaceous igneous rock occur near Folsom, New Mexico, whose cavities, thoroughly sealed in many cases, are filled with oil of a light amber color and moderately fluid. The oil can hardly have been picked up from strata traversed by the lava, and the presumption is that it must be of volcanic origin. W. F. HILLEBRAND.

ANALYTICAL CHEMISTRY.

On the Assay of Tin. BY J. S. C. WELLS. *Eng. Min. J.*, June 16, 1904 (from *School of Mines Quarterly*, **12**, 295.—About 1 gram of finely pulverized ore is placed in a large test-tube with a number of pieces of zinc, some strong hydrochloric acid and several small pieces of platinum. The test is shaken frequently, and at the end of an hour the reduction to metallic tin is complete. The remaining zinc and the reduced tin are then dissolved in excess of hydrochloric acid, and filtered. The residue is again tested in the same way, with fresh zinc, platinum and hydrochloric acid. This is filtered, added to the first filtrate, and the tin in solution determined by any of the usual methods; or, the tin may be dissolved in ferric chloride, excess of zinc removed, and then determined volumetrically. J. W. RICHARDS.

Cupellation of Platinum Alloys Containing Silver or Gold and Silver. BY W. J. SHARWOOD. *J. Soc. Chem. Ind.*, April 30, 1904 (read before the New York Section).—Equal weights (100 mg.) of platinum were wrapped in about 5 grams of sheet lead, and cupelled with varying amounts of silver (0 to 100 mg.). From 25 to 37 mg. of lead were retained by the cupelled button. On dissolving in nitric acid, the loss of platinum by solution increased as the amount of silver increased. With 5 to 10 silver to 1 platinum, all the latter dissolved. The retention of lead is caused by the fact of the high melting-point of the alloy, oxidation ceasing when the button solidifies. Increase of gold present decreased the amount of lead retained, and decreased also the amount of platinum dissolved in parting. The results are, quantitatively, not very consistent, and further tests are needed.

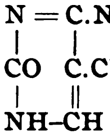
J. W. RICHARDS.

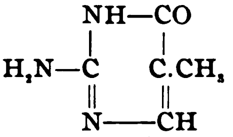
ORGANIC CHEMISTRY.

On Phenylmalonic Nitrile (Preliminary Paper). BY JOHN C. HESSLER. *Am. Chem. J.*, **32**, 119–130.—In a previous investigation (*Am. Chem. J.*, **22**, 169), the study of the decomposition of the sodium and silver salts of ethylmalonic and benzylmalonic nitriles made it appear probable that in these salts the metal is in union with nitrogen. To secure further evidence upon this point, an attempt was made to prepare phenylmalonic nitrile and its salts. Phenylcyanacetic ester was changed to phenylcyanacetamide, and this then converted into phenylmalonic nitrile. The sodium salt of the nitrile was obtained, but not the pure silver salt. EXPERIMENTAL.—*Phenylcyanacetic ester* was prepared by the action of sodium upon an ethereal solution of benzyl cyanide and ethyl carbonate, according to the following reaction: $C_6H_5CH_2CN + CO(OC_2H_5)_2 + Na = C_6H_5C(CN) : C(ONa)OC_2H_5 + C_2H_5OH + H$. The crude cyan ester was purified by fractioning under diminished pressure. The pure substance is a colorless oil, insoluble in water, but soluble in organic solvents, b. p. 165.5° at 20 mm. At ordinary pressure it boils at 275°, with only slight decomposition. Its sp. gr. at 22° is 1.09. It is not affected by cold dilute acids, but dissolves readily in aqueous alkalies; in the latter solution, saponification to the cyan acid occurs after standing for some hours. It dissolves readily in ammonia, giving, after some time, crystals of the amide. The *sodium salt* of the cyan ester was obtained as a white, hygroscopic powder by the action of sodium upon an absolute ethereal solution of the ester. Its dilute alcoholic solution gives a white precipitate with silver nitrate which soon turns black. *Phenylcyanacetamide*, from the above ester and ammonia, separates from alcohol in large crystals, m. p. 147°, practically insoluble in cold water, very difficultly soluble in ether, and only slightly soluble in cold alcohol. *Phenylmalonic nitrile* was prepared by the action of phosphorus pentachloride upon the amide. It is difficultly soluble in water or in ligroin, but readily soluble in alcohol or ether. It crystallizes from dilute alcohol in large, white crystals; from fusion, in hexagonal plates. It boils at 152°–153° at 21 mm. pressure. It is not easily saponified even by concentrated alkali. The *sodium salt* was obtained by the action of sodium upon an ethereal solution of the nitrile. It is white when freshly prepared, but after standing *in vacuo* over sulphuric acid for several days it turns violet. Its aqueous solution gives precipitates with solutions of barium chloride, lead acetate, copper sulphate, silver nitrate, and mercuric chloride. All attempts to obtain a pure silver salt from the nitrile failed because of the instability of this salt. *Phenylcyanacetic acid* was prepared by saponifying its ethyl ester. It melts sharply at 92°, is soluble in water, alcohol, ether, or hot benzene, but insoluble in ligroin. At 150°–160° it decomposes into carbon dioxide and benzyl cyanide. Its *silver salt* is a white granular solid. *Phenylmethylcyanacetimido ethyl ester* was prepared by dissolving phenylmalonic nitrile in absolute alcohol, adding sodium and then methyl iodide. It is a faintly aromatic oil, b. p. 152°–153° at 16 mm., 158°–159° at 22 mm. to 23 mm.; sp. gr. very nearly 1.06 at 23°; insoluble in water, but readily

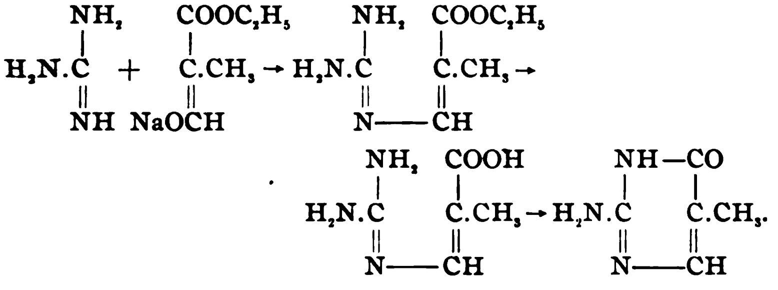
soluble in alcohol or ether. *Phenylbenzylmalonic nitrile* was prepared in a similar manner, using benzyl chloride instead of methyl iodide. It crystallizes from ether ligroin in long needles, easily soluble in ether and alcohol, but practically insoluble in ligroin and water. It is not affected by aqueous alkalies even at 100°. *Phenylbenzylcyanacetic ethyl ester*, from phenylcyanacetic ester, benzyl chloride and sodium, is a thick colorless liquid, sp. gr. 1.13 at 22°, insoluble in water, and not affected by aqueous alkalies.
M. T. BOGERT.

Researches on Pyrimidines. Synthesis of 2-Amino-5-Methyl-6-Oxypyrimidine (Sixth Paper). BY TREAT B. JOHNSON AND SAMUEL H. CLAPP. *Am. Chem. J.*, 32, 130–145.—The two aminomethyloxypyrimidines which can give thymine on hydrolysis are 2-oxy-6-amino-5-methylpyrimidine (formula I) and 2-amino-6-oxy-5-methylpyrimidine (formula II):

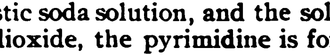

(I)


(II)

2-Oxy-6-amino-5-methylpyrimidine and its hydrolysis to thymine have already been described (*Am. Chem. J.*, 31, 592). The present paper deals with the other isomer, which the authors have synthesized by condensing guanidine with the sodium salt of formylethylpropionate, the reaction proceeding by the following steps:

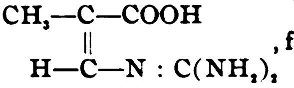


The intermediate α-methyl-β-guanidinacrylic acid was found to exist in two modifications, apparently *cis* and *trans* stereomers. The sodium salt of oxymethylenehippuric ester condenses smoothly with pseudoethylthiourea to form 2-ethylmercapto-5-benzoylamino-6-oxypyrimidine, which dissolves in alkali and is reprecipitated by acids unaltered. Ethyl formate condenses with phthalimidoethylacetate to the sodium salt of formylphthalimidoethylacetate, and this, in turn, can be condensed with pseudoethylthiourea to 2-ethylmercapto-5-phthalimido-6-oxypyrimidine, which is changed by alkali into the corresponding pseudoureaphthalimidoacrylic acid. EXPERIMENTAL.—*2-Amino-5-methyl-6-oxypyrimidine*. Sodium formylethylpropionate was added to an aqueous solution of guanidine and the clear solution allowed to stand for some time. On neutralizing with dilute sulphuric acid, an insoluble brown precipitate of *trans*-α-methyl-β-guanidinacrylic acid was obtained. The pyrimidine base was then precipitated from the filtrate with phosphotungstic acid or mercuric chloride. In a second condensation, after mixing the guanidine and propionate, caustic soda was added, the solution left for ten hours at 40°–50°, then heated for three hours on the steam-bath, and the *trans* acid precipitated by neutralizing with acetic or dilute sulphuric acid. The filtrate was precipitated with an excess of mercuric chloride, the mercury removed with hydrogen sulphide, and the filtrate concentrated. On cooling, the crystals obtained consisted of a mixture of the pyrimidine base with *cis*-α-methyl-β-guanidinacrylic acid. The free pyrimidine crystallizes from water in stout prisms or long, slender, needle-like prisms. It melts at 320°–321° with violent effervescence, and contains no water of crystallization; 100 parts of water at 25° dissolves 0.43 part of the base. Heated for five hours in a sealed tube with 25 per cent. sulphuric acid, it was not hydrolyzed to thymine. It dissolves readily in caustic soda (2 per cent. or 9 per cent.) and separates unchanged on neutralizing the solution. *Chloride*, stout prisms. *Picrate*, yellow microscopic crystals, practically insoluble in boiling alcohol and water. The *sulphate*, $C_5H_7ON_3.H_2SO_4$, crystallizes from water in flat prisms or plates. *Chlorplatinates*, $(C_5H_7ON_3.HCl)_2PtCl_4.4H_2O$, and $(C_5H_7ON_3.HCl)_2PtCl_4.2H_2O$: the latter separates in thick tables, m. p. 254°–255°. *Trans-α-methyl-β-guanidinacrylic acid*,



$$\begin{array}{rl} & \mathrm{CH_3{-}C{-}COOH} \\ & \quad\ \ \| \\ \mathrm{(H_2N)_2C:N{-}} & \mathrm{C{-}H} \end{array},$$

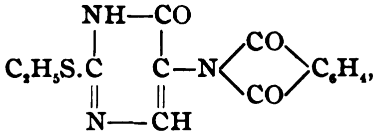
differs from the *cis* form and the pyrimidine by its insolubility in water, 100 parts water at 25° dissolving only 0.08 part acid. It was generally obtained as a brown amorphous precipitate. It crystallizes from water in poorly developed prisms, melting at 329°–332° with violent effervescence. It possesses both acid and basic properties. It could not be changed to the *cis* modification or to the pyrimidine by boiling in water for six hours. Dissolved in 9 per cent. caustic soda solution, and the solution then neutralized with carbon dioxide, the pyrimidine is formed and separates in crystals. From solution in 2 per cent. caustic soda, the *trans* acid reprecipitates unaltered on neutralizing. *Cis-α-methyl-β-guanidinacrylic acid*,



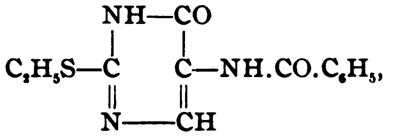
$$\begin{array}{ll} \mathrm{CH_3{-}} & \mathrm{C{-}COOH} \\ & \| \\ \mathrm{H{-}} & \mathrm{C{-}N:C(NH_2)_2} \end{array}$$

, forms slender, needle-like

prisms, melting at 319°–320° to a clear, yellow oil, followed by a slight effervescence and slow decomposition. It is about twice as soluble in water as the pyrimidine, 100 parts water at 25° dissolving 0.84 part of acid, and contains no water of crystallization. Like the *trans* acid, it is changed to the pyrimidine by the action of 9 per cent. caustic soda, but differs from the *trans* acid in the fact that 2 per cent. caustic soda likewise changes it to the pyrimidine. *Condensation of Ethyl Formate with Phthalimidoethylacetate.*—Phthalimidoethylacetate was suspended in ether or benzene with the calculated amount of sodium, and ethyl formate added slowly. The *sodium salt of formylphthalimidoethylacetate* thus prepared is very unstable in aqueous solution, gradually separating phthalimidoethylacetate. If a solution of the salt be immediately acidified with hydrochloric acid, a precipitate is obtained consisting of phthalimidoethylacetate and 4-oxyisoquinoline-3-carboxylic ethyl ester. *2-Ethylmercapto-5-phthalimido-6-oxypyrimidine*,



from the sodium salt of formylphthalimidoethylacetate and pseudoethylthiourea, crystallizes from alcohol in rhombic plates, m. p. 230°–231°. Dissolved in alkali, and the solution then acidified with dilute hydrochloric or sulphuric acid, a precipitate of *α-phthalimido-β-pseudoethylthioureaacrylic acid*, $C_6H_4(CO_2)_2N.C(COOH):CH.N:C(SC_2H_5)NH_2$, was obtained. This same acid was obtained in the above condensation when the acid filtrates were allowed to stand. It separated in small prisms. It melted with violent effervescence at 130°–131°, then resolidified, and melted again at 229°. This behavior was due to the loss of water and re-formation of the pyrimidine derivative. *Sodium Salt of Oxymethylenehippuric Ethyl Ester*, $C_6H_5CONHC(COOC_2H_5):CH.ONa$.—This was prepared by condensing ethyl hippurate with ethyl formate in benzene solution in presence of sodium. *2-Ethylmercapto-5-benzoylamino-6-oxypyrimidine*,



results when the above sodium salt is condensed with pseudoethylthiourea. It crystallizes from alcohol in needles, m. p. 238°–239°, and does not decompose at 260°. It dissolves in alkali, and is reprecipitated unaltered by hydrochloric acid.

M. T. BOGERT.

Propanetrisulphonic Acid (Preliminary Paper). BY WILLIAM B. SCHOBER. *Am. Chem. J.*, 32, 165–167.—1,2,3-Tribrompropane and a saturated aqueous solution of ammonium sulphite were heated together under a reflux condenser (with a little ammonium carbonate, to prevent loss of sulphur dioxide) until all of the tribrompropane had disappeared. By filtering and concentrating the filtrate, the *ammonium salt* of propanetrisulphonic acid, $C_3H_5(SO_3NH_4)_3 + H_2O$, was obtained. It is very soluble in water, and difficultly soluble in absolute alcohol. From an aqueous solution, brilliant transparent crystals separate. In one case, a crystal weighing 12 grams was obtained. The salt effloresces on long standing, and does not melt or char at 360°. *Barium salt.* $(C_3H_5(SO_3)_2)_2Ba + 5H_2O$, from the ammonium salt and barium carbonate, is difficultly soluble in water or in hot alcohol. It separates from water in minute ill-defined crystals.

M. T. BOGERT.

On Certain Derivatives of Trichlortrinitrobenzol. BY C. LORING JACKSON AND PAUL SHORTT SMITH. *Am. Chem. J.*, 32, 168–181.—An alcoholic solution of sodium ethylate reacts vigorously with trichlortrinitrobenzene to give trinitrophloroglucin triethyl ether and trinitrophloroglucin. With sodiomalonic ester, dichlortrinitrophenylacetic ester is obtained, which, with a second molecule of sodiomalonic ester gives a compound which is either chlortrinitrophenylenaceticmalonic ester or chlortrinitrophenylenediacetic ester, the authors giving the preference to the former. Aniline converts the dichlortrinitrophenylacetic ester into dianilinotrinitrophenylacetic ester, which forms an addition-compound with two molecules of benzene. When dichlortrinitrophenylacetic ester is saponified, it yields 3,5-dichlor-2,4,6-trinitrotoluene. Under similar conditions, chlortrinitrophenylenemalonicacetic ester yields chlortrinitroxylene. EXPERIMENTAL.—*1,3,5-Trichlor-2,4,6-trinitrobenzene.*—Trichloraniline was prepared by the action of chlorine upon a chloroform solution of aniline, and, by eliminating the amino group, this was converted into 1,3,5-trichlorbenzene. By heating the latter with a mixture of fuming nitric and sulphuric acids, trichlordinitrobenzene was obtained, which by further nitration yielded trichlortrinitrobenzene. The *action of sodium ethylate* upon the trichlortrinitrobenzene resulted in the formation of trinitrophloroglucin and trinitrophloroglucintriethyl ether. *Dichlortrinitrophenylacetic ester*, $C_6Cl_2(NO_2)_3CH_2COOC_2H_5$, from trichlortrinitrobenzene and sodiomalonic ester, crystallizes in long slender white prisms, m. p. 130°–131°, insoluble in water, more or less soluble in most organic solvents. *Dianilinotrinitrophenylacetic ester*, $C_6(C_6H_5NH)_2(NO_2)_3CH_2COOC_2H_5$, from the latter compound and excess of aniline, crystallizes from benzene in long, slender, red prisms, m. p. 201°, insoluble in water, more or less soluble in most organic solvents. It combines with two molecules of benzene to an *addition-compound*, which forms beautiful golden-yellow crystals, which, at 20°–30°, lose their benzene in a few hours. *3,5-Dichlor-2,4,6-trinitrotoluene*, obtained by saponifying dichlortrinitrophenylacetic ester with strong hydrochloric acid in a sealed tube at 150°–160°, crystallizes from dilute alcohol in long, slender, flat, white prisms, or in little crystals resembling elongated rhombohedra, m. p. 200°–201°. *Chlortrinitrophenylenaceticmalonic ester*, $C_6Cl(NO_2)_2(CH_2COOC_2H_5)CH(COOC_2H_5)_2$, from dichlortrinitrophenylacetic ester and sodiomalonic ester, crystallizes from alcohol in white branched needles, m. p. 147°–148°, insoluble in water, more or less soluble in most organic solvents. Heated in a sealed tube with strong hydrochloric acid at 160°–170°, 5-chlor-2,4,6-trinitroxylene results. M. T. BOGERT.

On the Optical Isomers of β-Dihydrofurfuran-αα'-dicarbonic Acid. BY H. B. HILL AND F. W. RUSSE. *Ber. d. chem. Ges.*, 37, 2538–2540.—It has been shown that the "β-dihydrofurfuran-α,α'-dicarbonic acid" of Seelig is the racemic form, and the present paper describes the separation of this racemic form into its optically active components. EXPERIMENTAL.—The cinchonine salt of the laevo acid is only about half as soluble in water as that of the corresponding dextro acid. By five recrystallizations from water, pure laevo acid may be obtained. Most of the dextro acid remains in the mother-liquor from the first crystallization, and is then changed to the strychnine salt, since this salt of the dextro acid is less soluble than the corresponding salt of the laevo acid. By recrystallization, pure dextro acid was obtained. In the case of both acids, purification was continued until rotatory power remained constant. As thus purified, the two acids showed the same specific rotatory power, with opposite algebraic signs. Both acids crystallize with 1 molecule of water, and melt at 144° when anhydrous. The *barium salts* crystallize with 1½ molecules of water, the *lead salts* with two. The latter are much more soluble than the lead salt of the racemic form.

M. T. BOGERT.

Dimethyl Racemic Acid: Its Synthesis and Derivatives. BY HARRY F. KELLER AND PHILIP MAAS. *Proc. Am. Philos. Soc.*, 43, 105–112.—Dimethyl racemic acid was prepared from diacetyl, through the dicyanhydrin, and was purified by crystallization of its barium salt. Most of its physical properties have been reported in a previous communication. Its water of crystallization is completely expelled at 105°. *Salts: Neutral sodium salt*, $C_6H_8O_6Na_2 + 4H_2O$; minute efflorescent needles. *Sodium potassium salt*, $C_6H_8O_6NaK + 2H_2O$. The neutral salts of sodium, potassium and ammonium are very soluble in water. The salts of the alkaline earths and of the heavy metals are insoluble or nearly insoluble in water, although in a few cases they are difficult to precipitate in aqueous solution. Many of the insoluble salts contain water of crystallization which they retain tenaciously at high temperatures. *Calcium salt.* The amount of water of crystallization which it contains varies from 1 to $1^1/_2$ molecules, depending upon the conditions of its formation, and is not completely expelled below 215°. *Barium salt,* $C_6H_8O_6Ba + 2H_2O$. *Magnesium salt,* $C_6H_8O_6Mg + H_2O$; white bulky precipitate. *Manganese salt,* $C_6H_8O_6Mn + {}^1/_2H_2O$; crystalline precipitate, of faint pink tint. *Zinc salt,* $C_6H_8O_6Zn + H_2O$, contains either half a molecule or one molecule of water of crystallization, and is generally obtained as a granular white precipitate. *Cobalt salt,* $C_6H_8O_6Co + H_2O$; purple crystalline crust. *Nickel salt,* $C_6H_8O_6Ni + H_2O$; apple-green crystalline crust. *Cadmium salt,* $C_6H_8O_6Cd$. *Lead salt,* $C_6H_8O_6Pb + 2H_2O$, has been described in a previous paper. *Copper salt,* $C_6H_8O_6Cu$. *Silver salt,* $C_6H_8O_6Ag_2$; voluminous amorphous precipitate, darkening in the light. By the dry distillation of dimethyl racemic acid, two acids appear to be formed, neither of which was identified. M. T. BOGERT.

PHARMACEUTICAL CHEMISTRY.

Progress in Pharmacy. BY M. I. WILBERT. *Am. J. Pharm.*, **76**, 441.—It is reported that acetanilide is sometimes contaminated with acet-toluidine, and it is recommended that doubtful samples be tested for this impurity.

Antiseptic paper. A patent has recently been granted in Germany, covering the addition of certain antiseptics to paper pulp. It is proposed to use the paper made in this way for wrapping and protecting easily decomposed food products. The antiseptics used are boric acid, salicylic acid and thymol.

Cellotropin-mono-benzoyl-arbutin is prepared from arbutin and benzoyl chloride. It is tasteless and odorless and slightly soluble in alcohol and water. Hydrolytic agents decompose it into benzoic acid, hydroquinone and glucose. Uses: tuberculosis and scrofula.

Cod-liver oil. The production of cod-liver oil in Norway during the past season is reported to amount to 12,770 barrels as compared with 2,300 barrels in 1903, and 28,210 barrels in 1901.

Gallogen is a trade name for ellagic acid, which is made by heating gallic acid with iodine, or by extracting the pods of divi-divi with alcohol and then precipitating this extract with water. This precipitate contains ellagic-gallic acid, which, upon being heated to 110° C., is converted into ellagic acid. It is a yellowish, odorless, crystalline powder, readily soluble in alkaline liquids. It is suggested that it be used as an intestinal astringent.

Iodylin, another substitute for iodoform, is iodo salicylate of bismuth. It is odorless, non-toxic and non-irritant and is stated to be useful as a dusting powder for wounds.

Isopral, trichlor-isopropyl alcohol, is a new hypnotic, resembling chloral hydrate and chloretone, but is stated to be more efficient and less toxic than chloral hydrate.

Lecithin, in its commercial form, is generally obtained from the yolk of eggs. It is indicated in all affections where phosphorus would be used to advantage.

Lactucon has been separated from *lactucarium*. It is odorless and tasteless, insoluble in water, soluble in ether, benzene, benzine, chloroform, carbon disulphide and hot alcohol; melts at 184° C., and has the formula $C_{23}H_{36}O_2$.

Maretin is methylated acetanilide. It melts at 183° or 184° C., is sparingly soluble in water, ether, chloroform and alcohol. It is an antipyretic.

Oxalic acid has been successfully used in a vehicle consisting of a mixture of infusion of tea and syrup of orange peel as an expectorant in asthma and bronchitis.

Phytin is stated to be acid magnesium and calcium hydro-oxymethylene-diphosphate, and to contain 22.8 per cent. of plant phosphorus.

Salite, a salicylic acid ester of borneol, is an oily liquid, which, mixed with olive oil in equal parts, is used externally in articular rheumatism and neuralgia.

Stagnin, a yellowish brown powder, is prepared from the spleen of animals. It has been used to increase the coagulability of the blood.

Vioform, iodo-chlor-oxy-chinoline, is still another substitute for iodoform. It is stable in the air, tasteless, nearly odorless, and may be heated for an hour or more at 100° C. without decomposing in any way.

W. H. BLOME.

Useful Hints about Familiar Preparations. By Committee on Practical Pharmacy, Texas Pharmaceutical Association. *The Pharm. Era*, **32**, 162.—The old method of making aromatic waters by dropping the volatile oil dissolved in alcohol upon filter paper or absorbent cotton, picking apart, drying and finally percolating, is considered preferable to the present pharmacopoeial method. Another method recommended is that of shaking an excess of oil with hot distilled water, allowing to stand twenty-four hours, and then distilling. Aromatic waters should be kept in containers loosely stoppered with a plug of absorbent cotton.

To make camphor water, suspend, in a linen cloth, 40 grams of camphor in a gallon jar and pour upon this a gallon of hot distilled water.

Chlorine water rapidly loses its dissolved chlorine. The following formula is given for its preparation: Potassium chlorate, 2.18 grams; hydrochloric acid, 10.5 cc.; distilled water, to make 500 cc. The acid is gradually added to the chlorate and then enough water to make up the necessary volume.

Glycerin is directed to be used in the syrup of hydriodic acid, and the finished syrup, while hot, to be run into eight-ounce bottles.

Syrup of iron, quinine and strychnine phosphate is made by dissolving the quinine and strychnine in boiling alcohol and adding this solution to hot glycerine. Soluble ferric phosphate and sugar are dissolved in hot water, the two solutions are mixed and the desired volume obtained by adding sufficient syrup. This furnishes an excellent preparation of pea-green color.

Syrup of wild cherry is made by macerating and percolating the ground bark with hot water. The percolate is shaken with rasped hide, allowed to stand and filtered. Sugar is dissolved in the filtrate and glycerin and syrup added to the desired volume.

The gelatinization of tincture of kino is overcome by first omitting the glycerin in the official method, heating to 80° C., for three hours, then adding the glycerin and preserving in small bottles.

To make tincture of opium, mix the powdered drug with the calcium phosphate and water, then add sand and dry. Percolate with hot water to 700 cc. Chill this percolate, filter, evaporate to 500 cc. and add an equal volume of alcohol. This tincture is nearly free from the unpleasant odor of laudanum and is not so nauseating and constipating. W. H. BLOME.

Drugs Used by North American Indians. *Pharm Rev.*, **22,** 300.—A list of fifty-nine drugs, many of them in common use with us at the present time, which were used to a greater or less extent by the "simple and honest Indian doctor" in the treatment of various diseases and injuries. The plants are all native and range in their habitat from Lake Superior to the mouth of the Mississippi. W. H. BLOME.

The Nomenclature of the Glycerophosphate Preparations. BY M. W. BAMFORD. *Am. J. Pharm.*, **76,** 277.—Glycerophosphate preparations are being prescribed and used to a considerable extent at the present time. There seems to be little or no uniformity in the strength of the preparations manufactured by the different houses, nor are the ingredients always the same. The physican who prescribes an elixir of glycerophosphates does not know what will be the strength or even the ingredients of the remedy dispensed. In this matter of uncertainty this preparation recalls the case of the compound syrups of the hypophosphites which we all know vary very greatly in strength as well as in constituents. By bringing the matter to the attention of physicians and pharmacists before the various formulas become too firmly established, it is hoped to correct the tendency toward confusion. W. H. BLOME.

Bromide of Potassium. BY F. J. SMITH. *Am. J. Pharm.*, **76**, 368.—The author gives a table showing the results of the analysis of ninety-one samples of potassium bromide obtained from six different manufacturers. Chloride and carbonate were the only two impurities met with, and of these the chloride was generally present in greater quantity. All of the samples but two, from five of the manufacturers, satisfied pharmacopoeial requirements. Samples from the sixth source were in small, badly formed, caked crystals, evidently from the last crystallization from strong mother-liquors, contained appreciable quantities of chloride and were very alkaline. W. H. BLOME.

Dictionary of Remedies, Synonyms, and Various Proprietary Preparations. BY A. I. COHN. *Merck's Rept.*, **13**, 190 and 221.—This is an exhaustive, alphabetically arranged list of preparations, mostly of quite recent production, giving briefly their composition, medicinal and chemical properties and doses. It is intended to afford some information to the pharmacist concerning the synthetic and proprietary remedies he is called upon to dispense. The information has been obtained from many sources, and the author assumes no responsibility for the correctness of the formulas which must be considered as close approximations, since the actual formulas are not given out by the manufacturers. The article is continued from one publication to the next and includes many articles that are well-known and extensively used, as well as a much greater number that are seldom heard of.

W. H. BLOME.

SANITARY CHEMISTRY.

A Method of Destroying or Preventing the Growth of Algae and Certain Pathogenic Bacteria in Water Supplies. BY GEORGE T. MOORE AND KARL F. KELLERMAN. *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin 64.*—The bulletin gives an account of the experiments tried with copper sulphate and also the so-called colloidal copper, as to their effect in destroying or preventing the growth of algae and the destruction of pathogenic germs in water supplies, together with the results obtained and the conclusions drawn from these results. The method used in studying the action of copper sulphate on algae was to determine roughly the death points of various algae in Van Tiegham cells. Solutions of known strength of copper sulphate were prepared and 200 cc. of each solution were placed in an Erlenmeyer flask. The algae, if filamentous forms, were rinsed; if free-swimming, they were concentrated by the Sedgwick-Rafter method from 500 to 5 cc., and this 5 cc. was added to the contents of the Erlenmeyer flask. The small inaccuracy due to the addition of this 5 cc. to the 200 cc. of copper sulphate solution was disregarded. The results obtained, as shown by the tables that are given, were approximately as follows:

Group 1. Species with death points at greater concentrations than 1 part copper sulphate to 1,000,000 parts water.

Chlamydomonas Periformis Dill	1— 5,000
Raphidium Polymorphum Fres	1— 500,000
Desmidium Swartzii Ag.	1— 150,000
Stigeoclonium Tenue (Ag.) Rabenh	1—1,000,000
Draparnaldia Glomerata (Vauch.) Ag.	1—1,000,000
Navicula Sp.	1— 400,000
Scenedesmus Quadricauda (Turp.) Breb.	1— 500,000
Euglena Viridis Ehrb.	1— 500,000
Spirogyra Stricta (E. Bot.) Wille	1— 100,000

Group 2. Species with death points at concentrations betwee[illegible] 1 to 1,000,000 and 1 to 5,000,000.

Conferva Bombycinum Ag.	1—1,000,000
Closterium Moniliferum (Bory) Ehrb.	1—2,000,000
Synura Uvella Ehrb.	1—1,000,000
Anabaena Circinalis Raben	1—2,000,000
Anabaena Flos-Aguae Breb.	1—4,000,000

Group 3. Species with death points at weaker concentrations than 1 to 5,000,000.

Uroglena Americana Calk.	1—10,000,000

A further test of the above concentrations was made under natural conditions by treating the pool from which the species under consideration was taken, or if this was impracticable, an additional series was carried through in aquaria of 15 liters' capacity, in which were kept gold fish, frogs, minnows, crustacea, and rotipers, and in no case was there an appreciable difference in the results so obtained from those obtained in the laboratory experiments. As the result of these experiments, practical tests of the method were made. The first near Ben, Va., was in connection with the raising of watercress for the market. The cress is raised in water-beds, made by constructing dams across a small stream which was fed by a thermal spring with a temperature the year around of about 70° F., a temperature very favorable to the development of *Spirogyra* and similar filamentous algae, which increased to such an extent after the cress was cut as to completely smother out a large part of the young plants. Copper sulphate was dissolved directly in the water, the amount added giving a dilution of 1 to 50,000,000 parts water. The success of the method was almost immediately apparent, eradicating completely the algae from the watercress, copper sulphate solution of this strength having no effect on the watercress. The first reservoir treated was one in Kentucky, holding 25,000,000 gallons, the water of which was offensively putrescent because of the presence of *anabaena*. Fifty pounds of copper sulphate were placed in a coarse sack attached to a boat and dragged over the surface of the reservoir, special attention being given to the regions which

ontained the greatest number of *anabaena* filaments. This gave
dilution of about 0.25 part copper sulphate to 1,000,000 parts
water. The results were as follows:

Anabaena per cubic centimeter July 6, 7,400; July 9, day of
reatment, number not determined; July 10, 54; July 11, 8;
uly 13, 15 and 20, none. It was thought by some sanitary ex-
erts that the cold, wet season was responsible in part for the
isappearance of the organisms, "but in July, 1904, the reser-
oir was still free from *anabaena* and a second treatment of 0.12
art copper sulphate per million resulted in the disappearance
f nearly all grass-green algae, leaving only harmless crustacea,
nd a few pediastra." (H. W. Hill, *Journal Mass. Association
oards of Health*, 14, 165.) Other experiments of a similar char-
cter were carried on in different parts of the United States with
eservoirs of a capacity of 10,000,000–600,000,000 gallons, with
esults all favorable. Detailed accounts of these experiments are
ot given as the authors deem it wise before so doing to wait till the
ffect of the treatment can be followed through another season.
he method advised by the authors for treating water with copper
ulphate to remove algae is to place the required number of
ounds of copper sulphate in a coarse bag—gunny-sack or some
qually loose mesh—and, attaching this to the stern of a rowboat
ear the surface of the water, row slowly back and forth over
he reservoir, on each trip keeping the boat within 10 to 20 feet
f the previous path. In this manner, about 100 pounds of cop-
per sulphate can be distributed in one hour. By increasing the
number of boats, and, in the case of very deep reservoirs, hang-
ing two or three bags to each boat, the treatment of even a large
reservoir may be accomplished in from four to six hours. The
effect of copper sulphate upon pathogenic intestinal bacteria was
also studied and the results are given in a series of tables which
show that the *spirillum cholerae* is slightly more sensitive to solutions of copper sulphate than *B. Typhosus*, and *B. Typhosus* than *B. Coli*. To destroy cholera germs requires about three hours in a 1 to 100,000 solution at a temperature of 20° C., and to destroy the typhoid germs, from three to five hours. At lower temperatures, 5° C., it requires about twenty-four hours. The concentration of copper sulphate required is thus shown to be considerably greater than the maximum necessary for the destruction of algae, and would be injurious to the aquatic animals normally present in a reservoir, if it were allowed to act for any great length of time, but experiments in the laboratory demonstrated that if allowed to remain in the water only from three to four hours in summer, and twenty-four hours in winter, the time required for the destruction of the pathogenic germs, it did not injure fish and frogs or the common aquatic plants. To remove the copper from solution in the water at the end of the required time the authors advise using some soluble carbonate or hydroxide. The effect upon water of metallic copper surfaces

producing the so-called colloidal solution of copper was then studied by Drs. Moore and Kellerman. The results with pathogenic germs are given in tables and show that using 4 sq. cm. of copper with 5 cc. water *B. Typhosus* is destroyed in eight hours, *B. Coli* in twelve hours, and the authors state that the laboratory experiments showed that it is possible to exterminate *Uroglena* and some forms of *Spirogyra* by suspending in water copper foil sufficient to give an area of 1 sq. cm. to each 100 cc. of water and that although this is not a practical method of treating a reservoir, it suggests the possibility of sheet copper being used as a preventative of pollution and they further state "that it is certain that water after standing from six to eight hours in a clean copper vessel becomes safe to drink even though it may have contained cholera and typhoid germs." Drs. Moore and Kellerman discuss at length in their paper, citing authorities, the effect of copper sulphate on fish, domestic animals and man. Black bass endure for many weeks concentrations of 1 to 50,000 with no apparent discomfort. German and minnow carp are killed in a few hours in a concentration of 1 to 100,000 and the most susceptible are killed in a few days in a concentration of 1 to 500,000. Mud fish are killed at practically the same concentration, gold fish at slightly greater, while yellow perch are perhaps less susceptible than gold fish. As to the effect upon man, after quoting numerous authorities, the authors of the paper state that "it is evident that there is still a considerable difference of opinion among eminent authorities as to the exact amount of copper which may be injurious, but as a very conservative limit we may accept 0.02 gram as the amount that may, with safety, be absorbed daily." And as to possible effect of using water which has been treated with copper sulphate they state: "Taking a dilution of 1 : 1,000,000, which in all cases would be sufficient to prevent the growth of a polluting algae form, it would be necessary to drink something over twenty quarts of water a day before an amount which is universally recognized as harmless, would be introduced into the system, while more than fifty quarts would have to be consumed before there would be danger of producing an unpleasant or undesirable effect." In conclusion the authors state "that harmless as the method undoubtedly is under proper control, it is not one for a novice to apply, that each reservoir must be regarded as an individual case requiring special knowledge and a particular prescription, that the method of treatment is not expected to replace slow sand filtration or any other efficient filtration, but that in cases where it is desirable to thoroughly sterilize a reservoir it is believed to offer a new and adequate way of dealing with the difficulty, and that it would be a matter of regret if the method should ever be regarded as a universal panacea to be used by every one regardless of the organisms to be eradicated, and the condition of the water."

LEONARD P. KINNICUTT.

INDUSTRIAL CHEMISTRY.

The Relation of the Character of the Asphalt to the Wearing Properties of an Asphalt Pavement. BY CLIFFORD RICHARDSON. *Eng. News*, June 2, 1904.—Mr. Richardson first speaks of filling the voids of the broken stone course upon which the asphalt composition rests with sand so as to prevent the asphalt from being itself pressed down into the stone by heavy travel, and then calls attention to using very fine stone dust in the composition itself. The fineness should be 85 per cent. through a 200 mesh screen and he recommends Portland cement for the purpose.

An advantage claimed for Trinidad asphalt is that it already contains a large percentage of very fine mineral matter amounting to 35 per cent. and this is probably better mixed with the asphalt than can be done artificially.

The trouble caused by the disintegrating action of water has been largely overcome by the use of proper fine mineral fillers.

S. P. SADTLER.

Distributing Gas at 25 Pounds Per Square Inch Pressure. BY GEORGE HELPS. *Am. Gas Light J.*, June 13, 1904.—Compression s obtained by the use of fans or compressors. The gas is carried at full pressure in the mains and then is reduced to from 3 to 20 nches for individual use. Some of the features attending its use are: 1. Better efficiency with incandescent burners; 2. It is easily tried, as the same mains could be again used for low pressure distribution; 3. It is cheaper as illuminant and source of power in gas engines and for heating; 4. Mains of one-fourth the size that are otherwise used may be employed; 5. The system could be more easily extended to a new section of town, due to the high pressure the gas is under.

Some disadvantages are: 1. The difficulty in obtaining reliable machinery in duplicate for compressing the gas; 2. Cost of pipes and joints to stand the pressure; 3. Cost of main and service governors; 4. Difficulty of making connection without disturbing main supply; 5. The hissing noise when using high-pressure burners; 6. Different meters.

The author says that the difficulty with the meters is the only one that is serious.

S. P. SADTLER.

The Briquetting Plant at Stockton, Cal. BY ROBERT SCHORR. *Eng. Min. J.*, August 18, 1904.—The largest briquetting plant in the United States is that of the San Francisco and San Joaquim Coal Co., at Stockton, Cal. Lignite found there is powdered (lump and all) for the briquetting, after mixing with screenings from San Francisco. The main bunkers are of 4,000 tons capacity and accessible to both rail and water. They are used both for the coal and the briquettes. Beneath the coal compartments are conveyors which carry the coal to the disintegrators and it is there elevated about 40 feet and consigned to the briquetting plant. The disintegrator is a No. 3 Williams crusher driven by means of a countershaft and 100 horse-power electric motor and reduces the coal to ⅛ inch size. A mixture of the two coals used goes into the crushers and then to driers, which consist of externally-fired revolving cones of 3 to 4 feet diameter and 20 feet length. The driers discharge into screw conveyors and the mixture goes then to the steam-jacketed mixers. In summer, this heating affects the drying and the special drier is not used. The mixer is of horizontal, double shaft pug-mill construction, 30 feet long and 3 feet wide. The binder is oil residuum from the company's oil refinery. The material leaving the mixer is too sticky for the press and is cooled by conveyors running outside the building. The machines were built by Messrs. Connor and Grant, San Francisco, and make 990 7-oz. briquettes per minute, or over 13 tons per hour. The briquettes sometimes drop 20 feet into the bunkers without injury. Only 6 men are required in the plant on account of the complete system employed. S. P. SADTLER.

PATENTS.

MARCH 29, 1904.

755.993. Joachim Brenner, Gainfarn, Austria-Hungary. **Dyeing wood.** The wood is steamed, and sulphuric acid of 10° to 20° is forced into it, and it is then dyed.

756,079-80. Joseph E. Tichon, New Bedford, Mass. Assignor to Theodore E. Parker, same place, and Henry F. Strout and J. Colby Bassett, Boston, Mass. Process of **brazing and brazing compound.** In the first the surfaces to be joined are coated with metal filings and boro-boracic acid, the second is for the mixture.

756,110. James Gayley, New York, N. Y. **Drying air.** The air is cooled, whereby the moisture is condensed ; it is then fed to the blowing-engine by an auxiliary blower and its compression is increased, till it enters the furnace.

756,124. Johann Lieb, Cologne, Germany. **Briquetting coal or coke.** Fine coal is mixed with a little resin, water added, and the mass molded, then heated to vaporize the water and soften the resin.

756,171. Rudolf Knietsch, Paul Seidel and George W. Meiser, Ludwigshafen on Rhine, Germany. Assignors to Badische Anilin and Soda Fabrik, same place. **Indoxyl and derivatives.** Phenyl glycerin compounds are heated with alkali oxides as sodium or potassium oxides or mixtures thereof.

756,173. Iens P. Lihme, Cleveland, Ohio. Assignor to Grasselli Chemical Co. same place. **Preserving wood.** The wood is thoroughly impregnated with zinc chloride by vacuum and pressure, and it is then treated with sodium silicate.

APRIL 5, 1904.

756,211. Chas. Butters, Berkeley, Cal. **Precipitating metals** from solutions. In the electrolytic separation of metals from cyanide solutions a cathode with a smooth surface of tin is used with a high density current.

756,223. Ernst Fahrig, Philadelphia, Pa. **Electrolyzing low-grade ores.** The pulped ore is mixed with water and an electrolyte as potassium cyanide then flowed between pairs of anode and cathode plates arranged in a tower; on these plates the metal is deposited, and the partially exhausted pulp is oxidized, leached and electrolyzed, these operations being repeated till all the metal is removed.

756,284. Solon O. Richardson, Jr., Toledo, Ohio. Assignor to Libbey Glass Co., same place. Making **glassware.** The piece is first roughly shaped by pressing, the interior etched by hydrofluoric acid, then washed and polished, and the design cut on the outside.

756,295. Virge Steger, Bonham, Texas. **Artificial stone.** 93 parts of sand are mixed with 7 of lime, moistened with a solution of 8 pounds sodium carbonate to 100 of water, molded into blocks and steamed for ten hours, the steam carrying 9 pounds caustic potash and 8 pounds sulphur flowers.

756,328. Samuel B. Christy, Berkeley, Cal. Removing **gold and silver** from cyanide solutions. The solution is forced to circulate repeatedly through an electrolytic cell having pervious anodes and cathodes of spongy metal (zinc anodes). The metals may be concentrated from large anodes to small ones.

756,485. Frederic J. Falding, New York, N. Y. **Desulphurizing furnace.** The furnace is supported on transverse arches spaced along the length of the furnace, these arches supporting stirrers having hollow columns and hollow arms through which a current of cooling water can circulate.

756,546. Robert van Benthuysen, Newark, N. J. Combined **hydrometer and pipette.** A pipette contains a hydrometer in the lower end so arranged that on filling the pipette by a rubber bulb on top, the hydrometer will float and can be read through the pipette, and the liquid returned to the storage vessel.

756,571. Rene Bohn, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. A thiosulphate is made to react on the naphthazarine intermediate body (see Pat. No. 661,438) in the presence of a mineral acid. The **dye** is soluble in water violet, in dilute caustic soda green, turning blue on exposure to the air, dyeing unmordanted wool violet, turning green-black on chroming with acetic acid.

756,593. John M. Davidson, Beaumont, Texas. Making **briquets.** Pulverized charcoal (87) is mixed with pitch of a high melting-point (10), and while melted, 2 to 3 parts of slaked lime are added to the mass.

756,626. Frank Hamell, Augres, Mich. **Preserving fish.** The fish are placed in brine, drained, and steamed from a compound of vinegar 20, spices $^1/_{32}$, soda $^1/_{32}$, and sugar 1, finally packed in barrels, covered with the mixture and hermetically sealed.

756,676. Frederick W. Midgely, Philadelphia, Pa. Assigno to International Wireless Telegraph Co. and Maria V. Gehring same place. **Wave responsive device.** A conical oxidize silver plug contacts by its point with a disk of burnished silve in a tube, the pressure being adjustable.

756,682. Maer Moskovitz and Caroline Moskovitz, Grea Falls, Montana. **Artificial fuel.** A fire kindler made o paraffin and sulphur 1 pound each, bran 2, and 25 drops of alcohol, the whole molded into form.

756,702. Albert B. Porter, Evanston, Ill. **Hydrometer guard.** The hydrometer is enclosed in a cylinder with annular guides at the ends by which the instrument is maintained in a central position without touching the sides of the vessel.

756,745. August A. Vogelsang, Dresden, Germany. Assignor to Charles Martin, Nottingham, England. Electrolytic **bleaching apparatus.** An electrolytic cell is combined on one side with tanks for salt, sulphuric acid and caustic soda, and on the other side with a bleaching vat with a false bottom adjustable up and down, and a measuring tank.

756,759. Hermann Wolf, Ludwigshafen-on-Rhine, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Zinc sodium hydrosulphite.** The salt is pressed dry *in vacuo* and surrounded with illuminating gas free from oxygen.

756,798. Theodore S. Pierce, Detroit, Mich. **Paving bricks.** Crushed slag 8 parts and cement 1 part are mixed with a solution, in 300 parts water, of sodium silicate 12, sal ammoniac 3, and green vitriol 1; a second solution is added of hydrochloric acid 2, and hydrofluoric acid 1, to the same amount of water, the bricks are then molded, air-dried and the first solution sprayed on while they are kiln-dried for three days.

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756,934. Peter J. Burns, Elizabeth, N. J. Assignor one-half to Louis H. Barker, Jersey City, N. J. **Protecting metal.** The metal is first painted, paper is laid on the green paint, and a second coat of paint applied.

756,936. Charles H. Carpenter, Decatur, Ind. **Artificial fuel.** Assignor to Globe Coal Mfg. Co., South Bend, Ind. Clay 900, vegetable refuse 650, sand 225 and powdered rosin 225 parts by weight.

756,963. John W. Howell, Newark, N. J. Assignor to General Electric Co. **Photometric apparatus.** The combination of a photometer, a reel and tape wound thereon, and means for cutting off a part of the tape forming a label corresponding to the position of the photometer.

756,975. Armand Muller-Jacobs, Richmond Hill, N. Y. Assignor to Cosmos Chemical Co., N. Y. **Varnish.** Adds stearamide to the usual varnishes.

757,036. John J. Griffin, Washington, D. C. Producing **ethyl sulphuric acid,** oxalic acid, etc. Passes an electric current from an anode of calcium carbide to a cathode of the same material through a bath of dilute sulphuric acid; numerous suggestions.

757,057. Robert E. Schmidt, Elberfeld, Germany. Assignor to Elberfeld Co., N. Y. **1,5-Nitroanthraquinone sulphonic acid.** The potassium salt forms microscopic plates difficultly soluble in cold water, readily reduced to 1,5-aminoanthraquinone sulphonic acid, and on treating with methylamine becomes 1-methylaminoanthraquinone-5-sulphonic acid.

757,058. As above for **1,8-nitroanthraquinone sulphonic acid.** The potassium salt crystallizes as above, but reduces to 1-8-aminoanthraquinone sulphonic acid, and is transformed into 1-methylaminoanthraquinone-8-sulphonic acid by methylamine.

757,109. Gillis Gulbranson, Hochst-on-Main, Germany. Assignor to Farbwerke, vorm. Meister, Lucius und Bruning, same place. **Blue-red lake.** The azo dye from diazotized-*o*-aminobenzoic acid and *b*-naphthol disulphonic acid is precipitated by lake bases as alumina, etc. Insoluble in cold or hot water, oils or varnishes.

757,136. Martin Moest, Hochst-on-Main, Germany. Assignor to Farbwerke, vorm. Meister Lucius und Bruning, same place. **Oxidizing organic compounds.** Oxides of the cerite group are caused to act on aromatic hydrocarbons in acid solutions.

757,185. Georg Erlwein, Berlin, Germany. Assignor to Cyanid Gesellschaft, same place. **Cyanamid salts.** Lime and carbon are heated in an electric furnace in the presence of nitrogen to a temperature higher than is required to form a carbide.

757,220. Allen R. Partridge, San Francisco, Cal. Assignor one-half to Frank W. Page. **Smelting ores.** A jet of steam or air is led across the top of the furnace, creating a strong draft from the bottom, which is open freely.

757,221-2. **As above** for apparatus to carry out the process, the furnace being water-jacketed in the last.

757,252. Ernst Bidtel, Milwaukee, Wis. **Magnesia cement.** Magnesia is mixed with magnesium sulphate, and barium chloride dry; when wet they produce magnesium chloride and barium sulphate, the chloride immediately combining with the magnesia to start the binding process and the barium sulphate acting as a filler insoluble in water. The dry materials are adapted for shipping.

757,276. John J. Deemer, Chester, Pa. Making **malleable iron or steel.** The bath of molten metal is surrounded by a ring of air blasts directed to a common center on the bath surface, and afterwards passing a similar series of jets from below upwards.

757,295-6. Wm. J. Gibbens, New Orleans, La., and Evi W. Christie, Valley Cottage, N. Y. Assignors to the Christie Engineering Co., New Orleans. Making **sucrose.** The sugar-cane is subjected to a series of alternate soaking in water and squeezing out the juice, the last liquid being used to soak the next lot of bagasse in. The last for the apparatus.

757,326. Thiebaud Luthringer, Lyons, France. **Waterproofing tissues.** Stearine, paraffin or spermaceti is dissolved in carbon disulphide, and the goods treated with the solution; they are then led through a closed chamber exposed to a current of carbon dioxide gas.

757,328. Fritz Ach, by Mitford C. Massie, Administrator, Washington, D. C. Assignor to F. Boehringer Sons, Mannheim-Waldorf, Germany. **Xanthine derivatives.** Chlorine is made to act on a bath of 8-methyl caffeine in chloroform, producing 8-trichloralkylxanthine, having three hydrogen atoms in position 8 replaced by chlorine and having no basic properties.

757,329. **As above** for similar products an 8-trichlormethylxanthine is boiled till dissolved and the formaldehyde has escaped; the solution is then condensed, cooled and neutralized, forming caffeine by replacing the CCl_3 group by a hydrogen atom.

757,330. As above for **alk-oxy-caffeine.** 3-Methoxy-8-hydroxycaffeine forms coarse, colorless needles melting at 228° to 229° C., soluble in hot alcohol and water and alkalies, and giving a murexide reaction. Made by heating 3-methoxy-8-hydroxycaffeine with hydrochloric acid, diluted, cooling, draining, and recrystallizing from methyl alcohol.

757,337. Philip Nolting, Bielefeld, Germany. **Adhesive.** The spent sulphite liquors of wood pulp are boiled with chlorate and filtered, neutralized and filtered again, and used as a solvent for glue.

757,352. Jules M. Sanguinetti, Lille, France. **Whiskey.** The yeast is selected from a wort similar to that used, and a uniform kind of wort is maintained throughout the entire process.

757,361. Frederich Stoffer, Hamburg, Germany. **Waterproofing leather.** A solution of caoutchouc is applied to the flesh side and talc powder rubbed in till a smooth surface is obtained.

757,370. Carl Vilmar, Zellerfeld, Germany. **Monobenzoylarbutin.** Benzoyl chloride is made to react on arbutin, and the mixture is neutralized with alkali.

757,419. Joseph M. Schutz, Minneapolis, Minn. **Medicinal diluent.** Pine tree bark is powdered, washed thoroughly with running water, dried, powdered and mixed with substances like sulphur, capsicum, or ginger. The resinous constituents of the bark are more effective than when prepared as usual.

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757,483. Jacob C. McClenahan, Wilmington, Del. **Artificial stone.** (See 711,436.) Sand is saturated with lime-water, alum and sulphuric acid, and a mold made of it, also a core, if a hollow pattern is required. This mold is filled with ordinary cement mixtures, made very liquid so as to flow.

757,514. Hermann F. M. Thoms, Steglitz, Germany. Assignor to Hermann Otto Wendt, Bremen, Germany. **Improving cigars.** The pointed end portion of the fillers is saturated with ferrous sulphate, dried and wrapped.

757,531. Utly Wedge, Ardmore, Pa. Preparing **pyrites** for desulphurization. The pyrites are mixed with sulphates of iron and lead, or iron and sulphuric acid, the iron as pyrites cinder or purple ore, and the mass is briquetted.

757,582. Heinrich Wachwitz, Hersbruck near Nuremberg, Germany. Assignor to Wachwitz Patents Syndicate, London, England. **Welding steel plates to aluminum plates.** The plates are thoroughly cleaned, then placed in juxtaposition and rolled together at a low heat insufficient to cause oxidation, then they are heated to a welding temperature, and again rolled.

757,617. Wm. S. Horry, Niagara Falls, N. Y. Assignor to Union Carbide Co., same place. Making **carbide.** The electric furnace has a number of electrodes arranged so as to subject the charge to a progressively increasing current till reaction takes place and carbide is made.

757,618-19-20-21. All **as above** for the process except the last. The last is for the **furnace.** The general character of the process is shown in claim one of 757,618, as follows: heating a body of conductive material, by causing different phases of a polyphase current to flow along paths which cross each other through said body.

757,631. Clarence D. Nirdlinger, St. Louis, Mo. **Tire-filling compound.** Glue 4, glucose 5, glycerol 8 pounds, are mixed with formaldehyde $^1/_{15}$, and chrome alum 1 and water $^1/_3$ of an ounce—to fill hollow tires.

757,649. Wm. Brothers, Prestwich, England. **Plaster of Paris.** The sulphate is boiled in water between 212° and 260° F., the water removed and the plaster dried before cooling below 175° F.

757,658. Hermann Hilbert, Heufeld, Germany. Making **glue**. Bones are ground to a coarse flour, suspended in water and acted on by hydrochloric acid and sulphur dioxide; it is then washed and heated with water to dissolve out the glue.

757,693. Jacob Tollner, New York, N. Y. Assignor to F. G. Dokkenwadel and H. M. Grant, same place. **Blasting compound.** Nitrate of potash and sulphur 15 each, sodium nitrate 30, and spent tan bark and horse manure 20 parts each.

757,713. John P. Arnold, Colfax, Ill. **Explosive compound.** Potassium chlorate 49, yellow potassium prussiate 30, potassium nitrate 10, sulphur 5, and tannin 6 pounds, the latter coating the insoluble ingredients by solution in alcohol and evaporating off.

757,778. Richard Schrader, Sierakowo, Germany. **Starch separation.** The starch liquor is fed through several centrifugals in one direction, while a stream of water flows in the opposite direction.

757,797. Arthur E. Wells, New York, N. Y. **Spirometer.** A glass cylinder with transparent scale and perforated base for air pipe, the lower edge of the bell visible through the cylinder on the graduations.

757,802. Albert E. Woodward, Nashua, N. H., and Harry Shoemaker, Philadelphia, Pa. Assignors to Marie V. Gehring, latter place. **Wave responsive device.** A plate of aluminum is placed in contact on each side with a mass of polished steel and a mass of rubber to make pressure. The metal must not be oxidized.

757,803. Walter B. Burrow, Norfolk, Va. Making **steel.** Dephosphorizing material is introduced by means of an air blast into different depths of the furnace by a varying pressure, and the gases are removed by suction.

757,817. Stanislaw Laszczynski, Kielce, Russia. Electrolytical separation of **copper and zinc.** An insoluble anode of lead is wrapped in a porous envelope of fabric whose thickness is in inverse proportion to the density of the current, to prevent oxidation.

757,821. Alexander T. Macfarlane, Rochester, England. **Basic refractory material.** All water is removed from Portland cement and tar, which are mixed and burned.

757,883. Thomas W. Capon, Ossining, New York. **Cementing material.** Sand is mixed with the oxides of magnesium and calcium and the mass stirred with hydrochloric acid in proportion to form oxychlorides; or dry magnesia and lime are mixed with dry chlorides.

757,948. Armand Muller-Jacobs, Richmond Hill, New York. Assignor to Cosmos Chemical Co., New York. **Sizing.** Stearamide or a similar amide is mixed with soap solution.

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758,086. Andreas Lurz, Vienna, Austria-Hungary. Assignor to Hugo, Ritter Gabler von Adlersfeld, Vienna, Austria-Hungary. Making **platinum photographic paper.** The paper is moistened on one side only, coated with suitable chemicals as a salt of lead and iron, then an iron salt and then one of platinum, dried, and the coating repeated in the same way till all the chemicals have been applied.

758,222. George C. Stone, New York, N. Y. Assignor to New Jersey Zinc Co. Apparatus for **filtering gases.** A vertical tank with conical ends is divided by compound partitions into three chambers, each chamber partially filled with liquid, an inlet at each end and a trapped outlet from each chamber. The top of each liquid chamber is a conical diaphragm, and the bottom a screen on which is placed loose filter material, the conical diaphragm being perforated in the center. The gas passes from end to end.

758,243. Gustav Goldman, Baltimore, Md. Process of **binding fibers** together. The fibers are mixed with dry pulverized glue and a hygroscopic salt, as magnesium chloride, or soda soap and zinc sulphate, and are pressed together.

758,244-5-6-7. All **as above,** substituting as binder, respectively, soap and alum, steamed resin and zinc oxide, resin and soap, resin and aluminum resinate.

758,312. Fritz Gunther, Berlin, Germany. Assignor to E. Schering, same place. **Photographic paper.** The paper is coated with a sensitive layer and then with a transparent soluble protective coating adapted to be dissolved in the bath, such as dextrin or gum arabic.

758,325. Thomas M. Lunan, Newark, N. J. Assignor to Central Stamping Co., N. Y. **Enameled ware.** A solution of potassium chlorate is applied to the cleaned article, then a coat of acid enamel, then ammonia is applied to precipitate the metallic constituent metals of the enamel as masses to produce a single coat mottled enamel.

758,335. Albrecht Schmidt, Hochst-on-Main, Germany. Assignor to Meister Lucius und Bruning, same place. **Celluloid compound.** Nitrocellulose is mixed with an alphylsulphonate of an organic radical as toluene sulphonic acid ethyl ester, etc.

758,346. Octave Avedyk, Brussels, Belgium. **Non-hygroscopic flour.** The grain is ground and bolted, the resultant flour soaked in water at moderate temperature, kneaded into a dough, the dough rolled to thin films, the films thoroughly dried and ground fine.

758,367. Thomas B. Joseph, San Francisco, Cal. Tank for **extracting metal.** A tank has a filter bottom, a perforated pipe placed above and near the bottom, and connected with an air compressor, the perforations direct in the streams of air slightly oblique to drive the slimes upward.

758,384. Frederick J. Rechert, Hornsey, England. **Coffee extract.** The coffee is heated to a light brown, ground and exhausted with water, the distillates collected and treated with methylated chloroform, and the same returned to the extract which is evaporated to drive off the chloroform, and then dried and ground.

758,450. Emil Joseph, Berlin, Germany. Preparing **dilute solutions.** Substances little soluble in water are dissolved in a solvent as adding an indifferent salt soluble in the solvent and of higher specific gravity than water, and pouring the mixture in a large quantity of a water holding a salt chemically indifferent to the substance dissolved but decomposed by the solvent forming a gas. As an illustration 20 parts coal tar are dissolved in 100 parts acetic acid, 50 parts calcium chloride added. Pour in 10,000 parts water. The reaction may be hastened by adding some sodium bicarbonate.

758,532. Wm. F. Hannes, Deming, New Mexico. Assignor one-half to Walter J. Browning, same place. Treating **ores.** The ore and fuel are fed in solid vertical strata, then mixed and oxygen supplied, the resulting gases being led through the ore with more oxygen to oxidize the ore which is then brought in contact with the incandescent fuel. WILLIAM H. SEAMAN.

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MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

The Orbicular Gabbro of Dehesa, California. BY H. H. KESSLER AND W. R. HAMILTON. *Am. Geologist*, 34, 133–140; plates.—This occurrence has already been described by Lawson (this Journal, **26**, R 284), but the authors had begun their work before the appearance of his paper. They give additional data and note, with descriptions, three varieties of orbicular structure. Lawson's paper contained an analysis of one type of orbule. The present paper gives one still less complete of the same type of rock as a whole, which reveals no marked difference in composition between the spheroid and its matrix. W. F. HILLEBRAND.

The Alkali Deposits of Wyoming. BY T. T. READ. *Am. Geologist*, 34, 164–169.—For an extended abstract of a paper on this subject, by Knight and Slosson (see this Journal, **24**, R 202). The present author regards as untenable the view of Knight, therein set forth, as to the ultimate origin of the materials forming the deposits, but is unable to offer a different theory. Their source he regards as in part from below, by the agency of uprising waters, and in part from the leaching of the surrounding strata. W. F. HILLEBRAND.

Lake Otero, an Ancient Salt Lake Basin in Southeastern New Mexico. BY C. L. HERRICK. *Am. Geologist*, 34, 174–189; maps, figures.—A variety of salts are found over this region, differing in different places—gypsum, salt, sodium and potassium carbonates, and borax. Over 300 square miles of surface are covered by a white expanse of gypsum sand dunes, whence the name "white sands." An economic future is predicted for the region. W. F. HILLEBRAND.

Preliminary Report on the Building Stones of Nevada. BY JOHN A. REID. *Univ. of Nevada, Bull. Dept. Geol. and Mining, Vol. 1, No. 1,* 61 pp.—But 19 of the 61 pages of this report are devoted to the building stones of the state. They are preceded by concise chapters on the nature and classification of rocks and the qualities of building stones. Chemical matter is lacking.

W. F. HILLEBRAND.

Annual Bulletin on the Mineral Resources of Kansas, 1902. BY ERASMUS HAWORTH. *The Univ. Geol. Survey of Kansas,* 135 pp.; maps, plates.—The chapter on hydraulic and Portland cement contains a few analyses of Kansas shales and limestones.

W. F. HILLEBRAND.

Molybdenite at Crown Point, Washington. BY A. R. CROOK. *Bull. Geol. Soc. Am., Vol. 15,* pp. 283–288; plates.—This occurrence, in Chelan County, is of interest because of its having yielded during 1902 almost the entire output for this country, about 12 tons of ore. The ore occurs as flakes and crystals in a quartz blanket-vein outcropping in a granite cliff. The mineral is found in small seams extending through the quartz from side to side and is never found in the accompanying granite. In fact, if the tests made are to be accepted as conclusive, the granite does not contain even traces of molybdenum, from which the author concludes that the source of the metal must be sought elsewhere. The crystals furnish no new crystallographic facts. At some distance from the outcrop chalcopyrite appears as an associate, but neither gold nor silver was observed at Crown Point.

W. F. HILLEBRAND.

Economic Resources of the Northern Black Hills. BY J. D. IRVING, with contributions by S. F. EMMONS and T. A. JAGGAR, JR. *U. S. Geol. Survey, Professional Paper No. 26,* 222 pp.; maps, plates, figures. Part I, by T. A. Jaggar, is on the general geology of the region. Part II, by far the greater portion of the report, is devoted to mining geology. The reader must be referred to the originals, for it is impossible to review here the mass of data accumulated regarding the peculiar and widely differing types of ores for which this district, containing the Homestake group of mines, is noted. The character of some of these ores and accompanying formations is illustrated by analyses, from the laboratory of the Geological Survey chiefly.

W. F. HILLEBRAND.

The Willamette Meteorite. BY HENRY A. WARD. *Proc. Rochester Acad. Sci.,* 4, 137–148; plates.—This remarkable iron, found in 1902, near the town of Willamette, Oregon, is of irregular shape, 10 feet, 3½ inches by 7 feet by 4 feet, and is estimated to weigh about 27,000 pounds, thus making it the fourth heaviest iron meteorite known. It is characterized by most astonishing holes, grooves, and caverns, which are supposedly due in part to aerial action during flight and in part to subaerial decay during the long time it lay in the forest of that rainy region. It belongs to the octahedral group and to the division (56) designated as Broad Octahedral Og. Analysis by Professor J. M. Davison gave: Fe, 91.65; Ni, 7.88; Co, 0.21; P, 0.09. Another by J. E. Whitfield afforded: Fe, 91.46; Ni, 8.30. Specific gravity, 7.77. W. F. HILLEBRAND.

Underground Waters of Southern Louisiana. BY G. D. HARRIS, **with Discussions of Their Uses for Water Supplies and for Rice Irrigation,** by M. L. FULLER. *U. S. Geol. Survey, Water Supply and Irrigation Paper No. 101,* 98 pp.; maps, plates, figures.—The first paper is an extension of one already noted in this Review, **25,** R 455. It, as well as the second, contains analyses of artesian waters, most of which, perhaps, appeared in the earlier report by Professor Harris. W. F. HILLEBRAND.

Contributions to the Hydrology of Eastern United States, 1903. BY MYRON L. FULLER. *U. S. Geol. Survey, Water Supply and Irrigation Paper No. 102,* 522 pp.—"The object of the report is to put on record the large amount of miscellaneous information which has accumulated in 1903, from localities not under special investigation, and which is not likely to be incorporated in other reports, and to make it immediately available to well and spring owners, drillers, scientific investigators, and the public at large." The report contains a vast number of analyses of spring and well waters, derived from a great variety of sources.
W. F. HILLEBRAND.

The Lime Industry in Indiana. BY W. S. BLATCHLEY. *Dept. Geol. and Nat. Resources, 28th Ann. Rep., 1903,* pp. 211–257; plates.—This report contains a number of analyses of limestones and some of lime, a few of which apparently appear in print for the first time. W. F. HILLEBRAND.

The Clays and Clay Industry of New Jersey. BY HEINRICH RIES AND HENRY B. KÜMMEL, assisted by GEO. N. KNAPP. 548 pp.; maps, plates, figures.—This extensive report is Volume 6 of the final report of the state geologist. Among its features of interest are chapters on the chemical and physical properties of clays. Analyses and results of physical tests are abundant. Especially important for the engineer are the series of tests on the breaking and crushing strength of New Jersey brick, "the most complete tests along these lines ever published in this country," and the research on the chemical composition of fire-brick and its relation to their refractoriness. W. F. HILLEBRAND.

The Stone Industry in 1903. BY D. T. DAY AND ALTHA T. COONS. *U. S. Geol. Survey, Ext. from Min. Resources U. S. for 1903*, 208 pp.—The greater part of this report is taken up with tables of analyses and physical tests of all kinds of building stones arranged by states, thus affording a fund of information collected from most scattered sources. W. F. HILLEBRAND.

A New Occurrence of Unakite. (A Preliminary paper.) BY W. C. PHALEN. *Smithsonian Miscellaneous Coll.*, *Quarterly Issue, 1*, pp. 306–316 ; map, plates.—This rock, composed essentially of quartz, orthoclase, and epidote, concerning which little is to be found in literature since its description by Bradley in 1874, has been studied by the author at a new locality, Milam's Gap, south of Luray, Va., where it occurs in hypersthene akerite (harzose). Both rocks are described and represented by analyses. *Unakite:* SiO_2, 58.32 ; $Al_2O_3(TiO_2)$, 15.77 ; Fe_2O_3, 6.56 ; FeO, 0.89 ; MgO, 0.09 ; CaO, 11.68 ; Na_2O, 0.32 ; K_2O, 4.01 ; H_2O, 1.73 ; P_2O_5, 0.48 ; MnO, 0.13 ; ZrO_2, trace; total, 99.98. *Akerite :* SiO_2, 60.52 ; $Al_2O_3(TiO_2)$, 16.99 ; Fe_2O_3, 0.60 ; FeO, 6.53 ; MgO, 1.59 ; CaO, 4.58 ; Na_2O, 2.83 ; K_2O, 3.91 ; H_2O, 0.88 ; P_2O_5, 0.78 ; MnO, 0.25 ; ZrO_2, Cr_2O_3, traces ; total, 99.42. The unakite is supposed to be a hydrometamorphic product of the akerite. Epidosite and an altered olivine-basalt are also described. In a footnote attention is called to an error in classification occurring in the author's paper on "The Rocks of Nugsuaks Peninsula, Greenland" (this Journal, **26**, R 157). The rocks there called omeose and dellenose should be liparose and toscanose.

W. F. HILLEBRAND.

The Baraboo Iron-bearing District of Wisconsin. BY SAMUEL WIEDMAN. *Wisconsin Geol. and Nat. Hist. Survey, Bull. No. XIII*, 190 pp.; maps, plates, figures.—True ore was first discovered in 1900 in this district, which lies in the center of the southern half of the state. It is mainly hematite and occurs in the lower member of the Freedom formation, of Pre-Cambrian age, which is otherwise made up of slates, dolomite, and chert, all ferruginous. The deposits are supposed to be lens-shaped and not to be of secondary origin. Limonite was first deposited in comparatively stagnant and shallow waters by processes similar to those acting to-day, including very possibly the agency of iron bacteria. Later, after burial, they were metamorphosed into hematite, the neighboring clay beds becoming slate, marl beds becoming dolomite and ferruginous dolomite, and silicious deposits compact chert. From an extended examination of the character of the present underground waters circulating through the iron formation it is concluded that no iron is now being deposited. The ore is of Bessemer grade. The report contains very many full analyses of ores, cherts, slates, dolomites, etc., and waters, both well and artesian, mainly by Dr. V. Lenher.

W. F. HILLEBRAND.

The Granites of North Carolina. BY THOMAS L. WATSON. *J. Geol.*, **12**, 373–407; plates.—The paper sets forth the more important points in the petrography and structure of the different types of granites and the gneisses of the state. Chemical matter is wanting.
W. F. HILLEBRAND.

The Coals of Illinois; Their Composition and Analysis. BY S. W. PARR. *Univ. of Illinois Bull., Vol. I, No. 20*, 40 pp.; figures.—The author takes exception to the common method of stating results of proximate analyses, in so far as relates to the volatile combustible matter. He divides the latter into "water of composition" and "true volatile combustible," this last being derived from the total volatile, less hygroscopic moisture, by subtracting all its oxygen and enough hydrogen to form water with the oxygen. The following table shows the results of this mode of calculation applied to three types of coal, compared with those obtained by the usual method.

	No. of pounds required to make 100 pounds of combustible.		Error of common method per 100 pounds of actual fuel.
Kind of coal.	Common method.	Proposed method.	
Pocahontas...	104.62	109.43	4.81
Illinois......	119.00	141.00	22.00
Lignite	120.23	162.49	42.26

The author obtains the factors needed for the above calculations without invoking the aid of ultimate analysis. Much depends upon the factor for "available" or combustible hydrogen, and the calculation of this involves careful determinations of total and fixed carbon. These are found by methods referred to at the end of this abstract. The available hydrogen in bituminous coals is "regarded as a part of the volatile hydrocarbon having the composition represented by the formula, C_5H_{12}, or, in semibituminous coals, by CH_4. The formula in each case, therefore, for calculating the hydrogen would be $\frac{C-c}{5}$ and $\frac{C-c}{3}$, in which C and c are the total carbon and the fixed carbon respectively. Therefore $(C-c)+\frac{C-c}{5}$ would represent the true volatile combustible, and this value subtracted from the total volatile matter equals the water of composition." The following table is supposed to show that the above principle of calculation gives results sufficiently in agreement with those by the usual method, but the author says it must not be concluded without further research "that so uniform a ratio is applicable to widely varying types of coal."

Coals.	Percentage of available hydrogen. $H - \frac{O}{8}$.	$\frac{C-c}{5}$.	Difference in percentage.
Average of ten Illinois coals	3.76	3.60	—0.16
Upper Freeport, Ohio and Penn	3.94	4.20	+0.26
Pittsburg, Penn	4.15	4.28	+0.13
Darlington, Penn	4.10	4.10	0.00
Hocking Valley, Ohio	3.34	3.67	+0.33
Thacker, W. Va	4.27	4.39	+0.12
Pocahontas, W. Va., No. 1 } $H = \frac{C-c}{3}$	3.85	3.35	—0.50
Pocahontas, W. Va., No. 2 }	3.97	3.62	—0.35

For Illinois coals there is reason to think that a graduation exists and that if the volatile carbon is represented by total carbon minus fixed carbon, or C—*c*, then,

When C—*c* = 10 per cent. the available hydrogen = $^1/_3$ of C—*c*.
" " = 15 " " " " " = $^1/_4$ " "
" " = 20 " " " " " = $^1/_5$ " "
" " = 25 " " " " " = $^1/_6$ " "

A curve was drawn with these figures as a basis, and their approximate correctness tested for fifty Illinois coals by plotting the volatile carbon as abscissas and those amounts of hydrogen as ordinates which would be required to produce the heat values indicated by the calorimeter.

The curve obtained in this diagram is employed to find, without analysis, the available hydrogen for use in calculating the calorific value according to the formula 8080 C + 34500 H + 2250S, wherein H is the available hydrogen, taken from the curve. The following table gives these calculated values in comparison with those obtained with two types of calorimeter.

Illinois coal.	Mahler-Atwater calorimeter.	Parr peroxide calorimeter.	Calculation 8080 C + 34500 "H."
Bloomington, lump	6566	6530	6687
Carterville, washed	7174	7185	7027
Danville, lump	6797	6762	6804
Elmwood, lump	7050	6990	7092
Moweaqua, lump	6152	6135	6256
Odin, pea	6227	6257	6333
Pana, slack	5383	5387	5745
Ridgeley, pea	5922	5964	6193
St. Johns, lump	6917	6911	6769
Spring Valley, washed	6150	6109	6346
Bloomington, 2nd V., slack	5510	5637	5742
Bloomington, 2nd V., lump	6447	6511	6571
Bloomington, 3d V., slack	6327	6326	6316
Bloomington, 3d V., lump	7140	7106	7119
Buxton, lump	6534	6520	6540
Centralia, slack	5911	6020	5879
Centralia, nut	6425	6476	6440
Danville, slack	6616	6672	6610
Eldorado, slack	5743	5777	5854
Fairbury, slack	5782	5868	5893

Illinois coal.	Mahler-Atwater calorimeter.	Parr peroxide calorimeter.	Calculation 8080 C +34500 "H."
Fairbury, lump	6804	6747	6773
Harrisburg, lump	7370	7379	7276
Sandoval, lump	6636	6677	6500
Springfield, slack	6653	6635	6589
Streator, 2nd V., slack	6343	6395	6371
Streator, 2nd V., lump	6962	6983	6948
Streator, 7th V., slack	6745	6775	6717
Streator, 7th V., lump	7257	7256	7119
Trenton, nut	5445	5500	5673
Trenton, slack	5808	5947	6008

The reviewer may be permitted to say, regarding the above-mentioned curve, that on the diagram the positions plotted for the fifty Illinois coals conform to it but indifferently well, and it is certainly not susceptible of extended application.

The bulletin concludes with a table of proximate analyses and heating values of 150 Illinois coals. The paper contains the following new or modified methods for the analysis of coals.

Total Carbon.—See this Journal, **26**, 294.

Fixed Carbon.—The method recommended by the Committee on Coal Analysis of the American Chemical Society is considered defective because of attack of platinum crucibles when coals high in sulphur are tested and because of the difficulty in always obtaining the same temperature with lamps of varying size of orifice. The author employs No. 00 porcelain crucibles, which are placed in a specially devised clay mantle and heated from beneath by a combination burner and blast. The burner is used three and one-half minutes and the blast the same length of time. When the blast is in operation the combustion leaves the tip of the burner and takes place only in the space surrounding the crucible within the mantle. The comparative results obtained on an Illinois coal show somewhat less than 1 per cent. more volatile matter by the modified method, and duplicate results are more accordant. It may be doubted if any practical advantage has been gained by this modification of the committee's method, however advantageous it may be in some respects, for the latter was put forth especially to obviate the need of a blast, which in many laboratories is not available.

Sulphur.—See this Journal, **26**, 1139.

Parr calorimeter.—Improvements in the bomb are described.

W. F. HILLEBRAND.

Some Features in the Analysis of Dolomite Rock. BY NICHOLAS KNIGHT. *Proc. Iowa Acad. Sci. for 1903*, 11, 127–131.—It is claimed that solution in hydrochloric acid without evaporation gives all of the small amounts of silica that the dolomite from Mt. Vernon contains (see this Journal, **26**, 373). Numerous tests made by students in Cornell College to ascertain the error attendant upon a single separation of calcium as oxalate from magnesium, show it to be in general very considerable, from 0.08 up to over 1 per cent., in mixtures corresponding to dolomitic rocks. A second precipitation is recommended.

W. F. HILLEBRAND.

A New Deposit of Fuller's Earth. BY ALFRED N. COOK. *Proc. Iowa Acad. Sci. for 1903*, **11**, 135–137.—Analysis of a supposed fuller's earth from the Black Hills, S. D., showing 51.28 SiO_2, 20.43 Al_2O_3, and 20.81 H_2O, besides small amounts of other constituents. The discussion of the analysis is extremely faulty.

W. F. HILLEBRAND.

Geology of Oktibbeha County [Mississippi]. *Bull. Miss. Agr. and Mech. Coll., Vol. I, No. 2*, 67 pp.; map, plates.—In this report, made up of papers by several authors, are analyses by the state chemist and others of waters, chalk, clay and soils.

W. F. HILLEBRAND.

Production and Use of Petroleum in California. BY PAUL W. PRUTZMAN. *California State Min. Bureau, Bull.* **32**, 230 pp.; maps, plates.—The title sufficiently indicates the scope of this comprehensive report, which contains the results of many analyses and other tests.

W. F. HILLEBRAND.

Catalogue of the Ward-Coonley Collection of Meteorites. BY HENRY A. WARD. 113 pp.; plates.

W. F. HILLEBRAND.

Statistical Review. BY THOMAS W. GIBSON. *Rep. Bureau Mines [Ontario], 1904, Vol. 13, Part 1*, pp. 1–45.—This is followed by reports on the Michipicoton Mining Division and the Mines of Western and Eastern Ontario, respectively, by different authors. No special comment is required.

W. F. HILLEBRAND.

Cobalt-Nickel Arsenides and Silver. BY WILLET G. MILLER. *Rep. Bureau Mines [Ontario] Vol. 13, Part I, 1904*, pp. 96–103.—This report is descriptive of a recently discovered occurrence of unique character, about 90 miles northeast of the well-known Sudbury locality. The ore, however, is quite different from that of Sudbury. Silver occurs in profusion in some of the deposits which have not as yet been developed. The chief minerals are (see p. xi of Introduction to the Bureau Report): niccolite, smaltite, chloanthite, native silver, erythrite, annabergite, dyscrasite, pyrargyrite, argentite. Native bismuth occurs in all the deposits, millerite and morenosite sparingly, besides tetrahedrite, chalcopyrite, graphite and secondary products, and other as yet unidentified species. Analyses of the ore are given.

W. F. HILLEBRAND.

The Abitibi Region. BY GEORGE F. KAY. *Rep. Bureau Mines [Ontario] Vol. 13, Part I, 1904*, pp. 104–134; plates.—The section on petrography contains descriptions of dolerites, syenites, diorites, porphyries, volcanic tuff and schists, and analyses of a dolerite (andose) and a syenite (akerose-andose).

W. F. HILLEBRAND.

Economic Resources of Moose River Basin. BY J. M. BELL. *Rep. Bureau Mines* [*Ontario*] *Vol. 13, Part I, 1904*, pp. 135–179; plates.—Contains analyses of limestones, iron ores, gypsum, clays, lignite and peat. W. F. HILLEBRAND.

The Northern Nickel Range. BY A. P. COLEMAN. *Rep. Bureau Mines* [*Ontario*], *1904, Vol. 13, Part I*, pp. 192–224; map, plates.—This report presents a continuation of work begun in 1902. The following is from the introduction to the Bureau Report, p. xii. "Dr. Coleman has arrived at the conclusion that the nickel-bearing area is really comprised in a continuous band of eruptive rock, entirely enclosing a roughly elliptical or boat-shaped area composed in the main of tuffs, slates, and sandstones, about 35 miles long and 8 miles wide. This nickel-bearing band on its inner edge is acid in composition and tends to phases of granite or syenite, but becomes more basic and passes into gabbro or norite as it approaches the outer rim, where the ore bodies are found. Dr. Coleman regards the belt of eruptive as probably synclinal in form and really constituting a gigantic laccolithic sheet, whose upturned edges rest on rocks of Archaean age both on the north and the south." The phases of the nickel-bearing eruptive are represented by analyses, and there are also partial analyses of numerous ore samples from the Strathcona mine.

W. F. HILLEBRAND.

METALLURGICAL CHEMISTRY.

Mining and Metallurgy at the Louisiana Purchase Exposition. BY T. A. RICKARD. *Eng. Min. J.*, July 7, 1904.—A long illustrated report on this subject, containing much information of interest and value to metallurgists and chemists.

J. W. RICHARDS.

Carborundum Fire-sand. BY T. J. TONE. *Foundry*, August, 1904.—Powdered carborundum carrying some free silica is a neutral refractory material, specific gravity 2.7, grayish green color, granular, easily crushed, and of low heat conductivity. It is being extensively used as lining material in various types of tilting and rotary melting furnaces used for melting brass, at temperatures at which magnesite or chromite linings soften. The carborundum sand resists also the scouring action of the copper and brass slags. The entire lining is rammed up in one solid block, presenting a smooth glazed surface, free from joints. As a binder, silicate of soda is used, diluted with water to a thin syrup, and a mixture made of 9 parts of fire-sand to one of the solution. This mixture is plastic, is rammed in place and dried slowly by a wood fire. Other mixtures are 85 fire sand, 10 silicate of soda and 5 fire-clay; 50 to 70 parts fire-sand to 30 or 50 parts best fire-clay, makes a very useful mortar, which can be used in laying fire-brick, general repair work or used as a wash or paint on the surface of fire-brick. J. W. RICHARDS.

The Davis-Colby Ore Roaster Case. *Iron Age*, July 14, 1904. —The court of appeals has sustained the decision which declared the rectangular iron-ore roaster now in common use, to embody the essential ideas of the Davis-Colby patents. The roasting of iron ores by the use of gas from bye-product ovens, may become an important factor in the iron industry, and the most efficient roaster is undoubtedly the vertical rectangular ore chamber, with gas combustion chamber on one side and gas-collecting chamber on the other, with perforated partition walls between, such as has been decided to be fundamentally covered by the Davis-Colby patents. J. W. RICHARDS.

Application of the Electric Furnace to the Metallurgy of Iron and Steel. BY P. MCN. BENNIE. *Electrochemical Industry*, August, 1904 (read before American Foundrymen's Association). —The possible applications were classed under four heads: (1) Treatment of molten pig-iron direct from the blast-furnace, refining in resistance type furnaces, where the molten iron, because of its poor conductivity, serves itself as the conductor; (2) Treatment of pig-iron with or without scrap, starting with the cold metals, using the electric arc to start the melting and afterwards the fluid slag as resistance material; (3) Direct reduction from the ores. Only applicable in a few localities, having special economic conditions; (4) Production of ferro-alloys. From the electrical standpoint the furnaces are divided into (1) arc furnaces; (2) arc-resistance furnaces (3); granular resistance furnaces; (4) direct heating resistance furnaces (5); induced current furnaces. The idea was suggested that in a foundry with a number of cupolas, an electric furnace in the form of a movable ladle could be used, so as to take metal from any of the cupolas and refine it to steel. Central stations supplying electric power would furnish foundries with very cheap power during the morning hours, when their load is ordinarily very light. J. W. RICHARDS.

Standard Specifications for Cast-iron Pipe. BY W. WOOD. *Iron and Steel Metallurgist*, April, 1904 (read before American Institute of Mining Engineers).—Specimen bars shall be 26 inches long, 2 inches wide and 1 inch thick, and when placed flat-wise on supports 24 inches apart and loaded in the center shall support 1,900 pounds with a deflection of not less than 0.3 inch, before breaking; if for pipes of over 12 inches in diameter, the test must support 2,000 pounds. Straight pipes shall be cast vertically in dry sand moulds. Pipes 18 inches or more in diameter shall be cast hub end down. Pipes shall be left in the flasks until they show no heat colors. No plugging or filling is permissible. Castings shall be heated to at least 300° F., before being dipped in the coal-tar pitch bath. J. W. RICHARDS.

Standard Specifications for Cylinders. BY W. WOOD. *Iron and Steel Metallurgist*, April, 1904 (read before American Institute of Mining Engineers).—The following are the result of long experience in large locomotive shops. The iron shall be close-grained gray iron cast in dry sand mould, containing silicon 1.25 to 1.75, phosphorus not over 0.9 and sulphur not over 0.10 per cent. The test bar 1.25 inches in diameter shall support 2,700 pounds in its center, between supports 12 inches apart, with a deflection not less than 0.08 inch. The test bar shall be cast 1.25 inches in diameter by 14 inches long, cast on end in dry sand.
J. W. RICHARDS.

Specifications for Malleable Cast-iron. BY S. G. FLAGG, JR. *Iron and Steel Metallurgist*, April, 1904 (report of Sub-committee to American Society for Testing Materials).—The iron may be melted in open-hearth, air furnace or cupola, but the latter is not recommended for heavy or important castings; sulphur shall not be over 0.06 nor phosphorus over 0.225. Directions are given as to how the test bar is cast; tensile strength shall not be less than 42,000 pounds, elongation not less than 2.5 per cent. in 2 inches. Transverse test of an inch square test bar on supports 12 inches apart shall not be less than 3,000 pounds, deflection being at least 0.5 inch. Castings must have received their full heat in the oven at least sixty hours, and the pots shall not be opened until the contents are "black hot." J. W. RICHARDS.

The Copper Smelting Industry in Mexico. BY J. W. MALCOLMSON. *Eng. Min. J.*, July 7, 1904.—A discussion of the reasons why copper smelting is largely superseding lead smelting, for collecting gold and silver: (1) A lead furnace of standard size smelts 100 to 150 tons of charge a day, but when altered to smelt copper can put through double the amount. (2) A lead furnace being necessarily run at a low temperature, the composition of the slag is limited, about 35 per cent. silica being the maximum; the copper furnace needs less attention to the slag, and can operate with a slag running 45 to 50 per cent. silica, with wide variations in lime and iron. (3) A lead furnace charge requires careful and complete roasting; the copper furnace charge very little or none. (4) Copper matte is a more efficient collector of the previous metals than lead; and will carry twice as much of them without any higher loss in the slag. J. W. RICHARDS.

Pyritic Smelting, VI, VII, VIII, IX. By E. D. Peters. *Eng. Min. J.*, July 7, 14, 21, 28, 1904—Continuation of the review from the June numbers of this journal. The bulk of evidence is that an iron matte alone, free from copper, will satisfactorily collect gold and silver under favorable conditions. The latter are: a rather liquid, silicious slag, of low specific gravity, to allow the light iron matte to settle properly; a good make-up of the ore, that is, a favorable juxtaposition of the particles of precious metals and the matte-forming minerals; the presence of small quantities of bismuth, tellurium, arsenic or antimony, because pure gold is not easily dissolved by pure iron sulphide, except in the presence of these impurities; the presence of iron sub-sulphide or even of metallic iron dissolved in the matte, which act as more efficient collectors than pure iron monosulphide, and which are produced by using larger quantity and higher pressure of blast.

Regarding the part played by lime, in this manner of smelting, the slag produced must be silicious, yet fusible, and of low specific gravity, and lime is the most available and efficient agent in attaining these ends, but there are occasions when it is more advantageous commercially to try and get along without it. It is not a *sine qua non*, and clean slags can be made without it, but it is always used when commercial considerations permit.

There is some doubt as to the influence of zinc. The zinc (1) may volatilize and form accretions or pass out as fume, or (2) may be dissolved as uncombined zinc oxide in the slag, or (3) may go into the slag as silicate or aluminate or ferrate. The first condition usually prevails where the percentage of blende in the charge is not high, or not over 6 to 7 per cent., and the ratio of concentration is high owing to powerful oxidation. The other conditions occur when the zinc in the charge is high, when the slag is silicious and when a mimimum of coke is used. The slag should not contain over 12 per cent. of zinc oxide. The proportion of blende which can be successfully handled without producing accretions or foul slags, etc., probably bears a direct relation to the vigor of oxidation in the furnace shaft, providing enough silica is present to form silicate with the zinc oxide as well as to form silicate with the ferrous oxide and lime present.

As to the degree of desulphurization commercially attainable, about three-quarters of the sulphur present in the ore can be economically removed. It is possible to remove 96 per cent., using a silicious slag, but such practice pays only under exceptional conditions. Hot blast favors the removal of sulphur.

J. W. Richards.

The Pioneer Electrolytic Copper Refinery of the United States. *Electrochemical Industry*, August, 1904.—A well illustrated and complete description of the electrolytic plant of the

Balbach Smelting Works at Newark, N. J., including also illustration and details of the electrolytic refining of the melted-down slimes. This is probably the first description of this refining works which has been published. J. W. RICHARDS.

Cyaniding Gold-bearing Sulphurets. BY S. B. CHRISTY. *Mines and Minerals*, June, 1904 (read before California Miners Association).—For the satisfactory treatment of sulphide concentrates by the cyanide process (1) they should be treated while fresh, as fast as they are produced, or else, if this is not possible, kept under water, so as not to be exposed to oxidation by the air; (2) they should be in fine division, so that the gold mechanically enclosed is exposed to the action of the cyanide; (3) they should not contain metallic iron, such as wears off shoes and dies in the stamps, and this can only be achieved by crushing in flint mills or in the arrastra; (4) the gold cannot be extracted by downward filtration, but the ore must be agitated with the solution, as by an air jet or by using a revolving barrel, the use of air aiding the solution of the gold; (5) the solution must be cleared either by a filter press or by settling and decantation, and decanting three-fourths the solution each time gives the best results; (6) the gold may be extracted from the solution without clarifying, by using electrical precipitation, but the results are poor, some of the sulphides in suspension being decomposed; a better plan is to clarify and use the standard methods of precipitation by zinc shavings or zinc dust or electricity. Prof. Christy has succeeded in extracting the gold down to 5 or 10 cents per ton of solution by his method of progressive electro-concentration. All sulphides containing tellurides in any quantity, or arsenides of iron or antimonides of iron or larger amounts of oxidized copper ores, are hard to treat; also gold ores containing high silver values, *i. e.*, silver approximately equal to half the value of the gold, or more. The cost of grinding and treatment should not be over $5 per ton. J. W. RICHARDS.

Notes on Platinum and Its Deterioration. BY W. CAMPBELL. *Electrochemical Industry*, July, 1904.—An investigation of the cause of brittleness of platinum when exposed continuously to temperatures above a red heat, such as in electrical pyrometers, resistance furnaces, etc. This change is found to be of two kinds: one is due to recrystallization alone, the polished section under a microscope at 35 diameters showing numerous large grains and crystals, quite sufficient to account for the brittleness; the other is due mainly to absorption and subsequent evolution of gases, where the wire is subjected to furnace gases, giving under the microscope a rough, incrusted, blistered surface, almost completely hiding the crystallization and causing swelling up of the surface. There is little evidence that the formation of compounds contributes to the brittleness. Half a dozen good photomicrographs accompany the article. J. W. RICHARDS.

Arsenic Mines at Brinton, Va. BY J. L. COWAN. *Eng. Min. J.*, July 21, 1904.—The ore is mispickel, and runs 25 to 35 per cent. arsenic. The ore is crushed and finely pulverized. It is put into a furnace where by gentle roasting the arsenic oxide is sublimed off, and caught in settling- or filter-bags. The plant began operations in January, 1904, and the present output is 90 tons of white oxide per month. All the handling is by automatic machinery, and no cases of poisoning have yet occurred among the workmen. The product is hauled 17 miles to Christiansburg by a motor car, capable of hauling four tons at a speed of seven miles an hour. J. W. RICHARDS.

ORGANIC CHEMISTRY.

On Certain Sulphamido Derivatives of Furfurane. BY H. B. HILL AND J. P. SYLVESTER. *Am. Chem. J.*, **32**, 185–228.—The object of the research was to determine whether sulphinides could be formed in the furfurane series. β-Sulpho-δ-methylpyromucic acid, β-sulpho-δ-chlorpyromucic acid, and β-sulpho-δ-brompyromucic acid, were changed to their acid halides by the action of phosphorus pentahalide, and the acid halide then treated with strong ammonium hydroxide solution, but the products were invariably the diamides and no sulphinides were obtained. With barium hydroxide solution, these diamides gave off ammonia in the cold, yielding β-sulphamidopyromucic acids, and these latter could not be changed to sulphinides. By the action of bromine and water upon the salts of these sulphamidopyromucic acids, one atom of bromine was introduced with simultaneous elimination of carbon dioxide, further action of the bromine then changing the methyl compound into sulphoacetacrylic acid, $CH_3COCH:C(SO_3H)COOH$, and the two halogen compounds into sulphofumaric acid, $HOOCCH:C(SO_3H)COOH$. EXPERIMENTAL.—*Derivatives of δ-Methylpyromucic Acid.*—δ-Methylpyromucic acid was prepared by oxidizing methyl furfural with argentic oxide in alkaline solution, and was then converted into the β-sulpho derivative by the action of cold fuming sulphuric acid. *Potassium sulphomethylpyromucate*, $K_2C_6H_4SO_6.2H_2O$, crystallizes from water usually in long, slender prisms. *β-Sulphamido δ-methylpyromucamide*, $CH_3C_4HO(CONH_2)SO_2NH_2$.—The above potassium salt was dehydrated and treated with phosphorus pentachloride, the acid chloride thus produced added gradually to well cooled concentrated ammonia water, and the diamide obtained recrystallized from water. It crystallizes i prisms, m. p. 196°–197°. By the action of alkalies or baryt water, ammonia is evolved and *β-sulphamido-δ-methylpyromucic acid* formed, crystallizing in prisms, m. p. 217°–218°. All attempts to dehydrate the latter and obtain a sulphinide failed. *Barium salt*, $Ba(C_6H_6NSO_5)_2.3H_2O$; spherical masses of fine, short needles. The *calcium salt* was so soluble in water that it could not be obtained as a solid. *Lead salt*, $Pb(C_6H_6NSO_5)_2.xH_2O$; long, slender prisms. *Action of Bromine. β-Sulphamido-δ-methylbromfurfurane.*—By the action of one molecule of bromine upon a cold aqueous solution of the barium salt of the sulphamidomethylpyromucic acid, carbon dioxide is eliminated and β-sulphamido-δ-methylbromfurfurane obtained. This melts at 123°, crystallizes in prisms, and does not lose ammonia when boiled with 15 per cent. alkali, but acts as a weak acid. Its *potassium* and *silver salts* were prepared. Its salts are easily attacked by bromine, with production of sulphoacetacrylic acid, which is then probably further oxidized. By the action of bromine upon the sulphamidomethylpyromucic acid, therefore, in addition to the reaction yielding the furfurane body, these other reactions are likely to occur also even when but one molecule of bromine is used. *Derivatives of δ-monochlorpyromucic acid.*—Ethyl pyromucate was converted into the δ-chlor derivative by the action of chlorine, the ester saponified, and the δ-chlorpyromucic acid purified through its barium salt. Treatment with cold fuming sulphuric acid then changed this to the β-sulpho-δ-chlorpyromucic acid, the anhydrous potassium salt of which was treated with phosphorus pentachloride, and the resultant chloride changed to the diamide by the action of strong ammonia water. *β-Sulphamido-δ-chlorpyromucamide* crystallizes from water in short, thick prisms, m. p. 212°. By the action of baryta water, ammonia is eliminated and *β-sulphamido-δ-chlorpyromucic acid* produced; prisms (from water), m. p. 194°–195°. No sulphinide could be obtained from the latter by dehydration. *Barium salt*, $Ba(C_5H_3NClSO_5)_2.3H_2O$; masses of fine needles (from water). *Calcium salt*, $Ca(C_5H_3NClSO_5)_2.6H_2O$(?); rectangular prisms (from water). *Lead salt*, $Pb(C_5H_3NClSO_5)_2.H_2O$; flat plates or thin prisms (from water). *Silver salt*, $AgC_5H_3NClSO_5$; prisms and plates (from water). *Potassium salt*, $KC_5H_3NClSO_5$; prisms or plates (from water). The behavior of the salts of β-sulphamido-δ-chlorpyromucic acid with bromine is similar to that of the salts of the corresponding methyl acid, giving a bromfurfurane first and then what is probably sulphofumaric acid. *β-Sulphamido-α,α-chlorbromfurfurane*, thus prepared, crystallizes from water in long needles, m. p. 134°-135°, and acts as a weak acid. Its *potassium salt* crystallizes in shining irregular scales, its *silver salt* in fine needles. *Derivatives of δ-Monobrompyromucic Acid.*—δ-Brompyromucic acid was prepared by the direct action of bromine upon pyromucic acid, and purified through its barium salt. This was changed to the β-sulpho derivative by the action of cold fuming sulphuric acid, and the potassium salt was then treated with phosphorus pentabromide, the acid bromide being converted into the diamide by the action of strong ammonia water. *β-Sulphamido-δ-brompyromucamide* melts at 219°–220°, and crystallizes from water in prisms. *β-Sulphamido-δ-brompyromucic acid*, from the latter and baryta water, melts at 190°–191°, and crystallizes in prisms, which usually appear in clusters of slender needles. Like the corresponding methyl and chlor acids, it could not be dehydrated with production of a sulphinide. *Barium salt*, $Ba(C_5H_3NBrSO_5)_2.3H_2O$; round masses of fine needles (from water). *Lead salt*, $Pb(C_5H_3NBrSO_5)_2.2H_2O$; shuttle-shaped crystals (from water). *Silver salt*, $AgC_5H_3NBrSO_5. 1.5 H_2O$; short, thick prisms (from water). *Potassium salt*, $KC_5H_3NBrSO_5.H_2O$; slender, rectangular prisms (from water). By the action of aqueous bromine, the salts of β-sulphamido-δ-brompyromucic acid are changed first to *β-sulphamido-α, α-dibromfurfurane*, and then to sulphofumaric acid. β-sulphamido-α, α-dibromfurfurane melts at 153.5°, and crystallizes from water in long, thin prisms. It possesses feeble acid properties. Its *potassium salt* crystallizes from absolute alcohol in beautiful shining scales. The *silver salt* is also crystalline.   M. T. BOGERT.

BIOLOGICAL CHEMISTRY.

The Specific Rotation of Some Vegetable Proteids. BY T. B. OSBORNE AND ISAAC F. HARRIS. *Ztschr. anal. Chem.*, 43, 372–376; also Report Conn. Expt. Sta., 1902, p. 458.—The specific rotation of carefully purified preparations of several vegetable proteins has been determined in order to get information respecting their relations to one another. The results of these determinations are as follows: $[\alpha_D]^{20°}$ for edestin $= -41.3°$; for excelsin $= -43.92°$; for globulin from flax seed $= -43.53°$; globulin from squash seed $= -39°$; $-38.57°$; $-38.32°$; amandin $= -56.44°$; corylin $= -43.22°$ and $-42.95°$; globulin, English walnut, $= -42.2°$; globulin, black walnut, $= -44.4°$; phaseolin $= -41.5°$; legumin $= -44.08°$; zein $= -27.9°$; gliadin $= -92.22°$.   F. P. UNDERHILL.

The Precipitation Limits of Some Vegetable Proteins with Ammonium Sulphate. BY T. B. OSBORNE AND ISAAC F HARRIS. *Ztschr. anal. Chem.*, 43, 378–382; also Report Conn Expt. Sta., 1902, p. 457.—Hofmeister has shown that a protein body is precipitated from its solution whenever ammonium sulphate is added up to a certain definite concentration and that this concentration is different for different protein bodies. The limits between the concentration at which the protein begins to separate and that at which it is completely thrown out of solution; are quite narrow and characteristic for the different proteins. In the following table are given some results obtained by subjecting some vegetable proteins to this procedure. The results are stated in terms of cubic centimeters of saturated ammonium sulphate, the lower limit being the quantity required to produce a turbidity in a solution whose total volume is 10 cc. and the upper limit the quantity required to precipitate all the dissolved protein.

Protein.	Lower limit.	Upper limit.
Globulin, English walnut	2.8	6.6
" black "	2.8	6.6
Edestin, hemp seed	3.0	4.2
" monochloride	3.0	3.9
Globulin, flax seed	3.1	4.7
" castor bean	3.1	4.5
" squash seed	3.3	4.4
Amandin, almond	3.5	5.3
Corlin, filbert	3.7	6.6
Excelsin, Brazil nut	3.8	5.5
Conglutin lupine	4.2	7.3
" "	4.6	8.7
Globulin cotton seed	4.6	6.4
Legumin vetch, lentil, horse bean	5.4	7.5
Phaseolin kidney bean	6.4	8.8

F. P. UNDERHILL.

The Trytophane Reaction of Various Proteins. BY T. B. OSBORNE AND ISAAC F. HARRIS. *Ztschr. anal. Chem.*, 43, 1–3; also Report Conn. Expt. Sta., 1902, pp. 462–463.—In this communication the Adamkiewicz (glyoxylic reaction of Hopkins and Cole) reaction indicative of the presence of the tryptophane group has been carried out on a large number of vegetable proteids. While some of the substances gave only a very slight reaction yet in no case could the reaction be called negative. The different proteid substances gave the reaction with varying degrees of intensity and from this behavior it is fair to assume that trytophane is contained in these bodies in different proportions.

F. P. UNDERHILL.

The Carbohydrate Group in the Protein Molecule. BY T. B. OSBORNE AND ISAAC F. HARRIS. *Ztschr. anal. Chem.*, 43, 299–302; also Report Conn. Expt. Sta., 1902, pp. 459–462.—The presence of the carbohydrate group in the protein molecule was tested for by the Molisch reaction and a large number of vegetable proteins were tested. Of the twenty-two preparations tested, only four failed to give the reaction although the intensity of the reaction varied considerably. F. P. UNDERHILL.

The State of Combination of Nitrogen in Protein Bodies. BY T. B. OSBORNE AND ISAAC F. HARRIS. *Ztschr. anal. Chem.*, 43, 286–299; also Report Conn. Expt. Sta., 1902, pp. 448–455.—The determination of the different forms of nitrogen according to the method of Hausmann applied to a number of vegetable proteids. It was found that the distribution of the nitrogen differs considerably from that of the proteids of animal origin.

F. P. UNDERHILL.

A Criticism of Moor's Claims for "Ureine" and His Method for the Quantitative Determination of Urea. BY WILLIAM J. GIES. *Am. Med.*, 7, 130–131.—Shows that Moor has no ground for claiming the existence of such a compound as "ureine."

F. P. UNDERHILL.

Chemical Notes on "Bastard" Logwood. BY BENJAMIN C. GRUENBERG AND WILLIAM J. GIES. *Bull. Torrey Bot. Club*, 31, 167–377.—The increase in the growth of a species of logwood (unmerchantable) among the districts of logwood growers was the cause for the present research, since it proposed to discover chemical differences in the two varieties of logwood. The most significant fact shown by elementary analysis of the heartwood of typical specimens of logwood was the lower carbon content of the poorer wood, which may be due to lower pigment content, hematoxylin being a compound containing nearly twice as much carbon as oxygen. No morphological differences are discernible between red logwood and bastard logwood in the young seedlings. Analyses of the various seedlings agreed too closely to warrant any conclusion but that the metabolism of the seedlings was essentially alike in the two varieties. Extractions with various solvents gave solutions of different colors indicating the presence of at least two pigments. Aqueous extracts gave different reactions to acids, alkalies, and other reagents. The differences are parallel to those between a fresh aqueous solution of commercial logwood "extract" and the same solution after it had become discolored on long standing. F. P. UNDERHILL.

VIII. Chemical Changes in the Souring of Milk. BY LUCIUS L. VAN SLYKE AND EDWIN B. HART. *Am. Chem. J.*, 32, 145–154.—The purpose of these experiments was to study the chemical changes that take place in the ordinary souring of milk, especially those changes that effect the decomposition of the milk sugar, the formation of lactic acid, and production of casein monolactate and casein dilactate. In one set of experiments fresh separator skim-milk was placed in an Erlenmeyer flask, stoppered with a plug of cotton, and allowed to stand at room temperature (18°–24° C.). From these, samples were taken from time to time for examination. In a second set of experiments 3000 cc. of pasteurized skim-milk to which had been added 50 cc. of sour milk to hasten the souring were divided in fourteen lots of 100 cc. each. One lot was placed at a temperature of 15.5° C. and another at 21°–27° C. It was found in all cases that the loss of milk-sugar increased quite rapidly for thirty-two hours (temperature 18°–27° C.) after which the change was small and ceased in seventy-two to ninety-six hours, when the maximum loss was reached, about 1.50 per cent., equivalent to 28 per cent. of the sugar originally present in the milk. The maximum amount of lactic acid formed was about 0.9 per cent., which is equivalent to about 62 per cent. of the lactose that disappeared. At the temperature used the milk coagulated in twenty-four to twenty-nine hours when the percentage of acid shown by titration had reached 0.6–0.7 per cent. The method employed in the separation of casein, casein monolactate, and casein dilactate when they occur together in milk is as follows: The milk is heated to 40° and the monolactate separates as a precipitate. When only casein and casein monolactate are present, simple filtration with washing serves to separate them. When the two lactates are present in the coagulum formed after heating, they are removed from the other milk constituents by filtration, and the monolactate is dissolved in a 5 per cent. solution of sodium chloride at about 55°, after which the two compounds are separated by filtration. When the milk was first visibly coagulated, 13–14 per cent. was in the form of monolactate, and 86–87 per cent. in the form of dilactate. With further increase in the acid in the milk the monolactate passes into the dilactate. F. P. UNDERHILL.

IX. A Study of the Artificial Digestion of Some Compounds of Casein and Paracasein Contained in Cottage and Cheddar Cheese. BY LUCIUS L. VAN SLYKE AND EDWIN B. HART. *Am. Chem. J.*, 32, 154–165.—These experiments were performed in order to ascertain how much truth there is in the popular belief that fresh cottage cheese is more easily digested than new cheddar cheese. The plan of the work was to subject to artificial peptic digestion the following compounds: paracasein, paracasein monolactate of new cheddar cheese, paracasein dilactate, casein monolactate, casein dilactate (cottage cheese) prepared by normal souring of milk and by addition of lactic acid to milk, and casein dihydrochloride. These different preparations were allowed to digest with pepsin under varying conditions (with and without addition of acid) and the influence of mechanical division, of increasing amounts of acid and the degree of digestion were estimated by the quantity of water-soluble nitrogen present at the end of digestion. In the absence of acid, paracasein fails to be digested by pepsin while paracasein monolactate (the chief constituent of fresh cheddar cheese), paracasein dilactate, casein monolactate, casein dilactate (cottage or Dutch cheese), and casein dihydrochloride are partially digested. Paracasein monolactate and casein monolactate in the absence of acid are digested more than are paracasein dilactate and casein lactate. In the presence of 0.4 per cent. hydrochloric acid, paracasein dilactate is digested more by pepsin than is paracasein monolactate. Paracasein monolactate and dilactate and casein monolactate and dilactate and casein dihydrochloride digest more readily and completely in the presence of free hydrochloric acid than in its absence. Casein dilactate and casein dihydrochloride do not differ in the rapidity and extent to which they are converted into soluble compounds by pepsin. The addition of acid after the beginning of the digestion increases the amount of proteid digested in both cottage and cheddar cheese. Cottage cheese made from whole milk digests more rapidly than that made from skim-milk, owing to the looser texture of the former. Fat in such cases does not impede digestion. The rapidity of digestion is dependent in part upon the fineness of division of the material to be digested. Cottage cheese is in a state of finer division than cheddar cheese. Cottage cheese may properly be regarded as more digestible than new cheddar cheese for two reasons: First, the casein dilactate, the chief solid constituent of cottage cheese, is more digestible in the presence of free hydrochloric acid than is paracasein monolactate, the principal nitrogenous constituent of new cheddar cheese; second, cottage cheese is in such a mechanical condition that it admits of easier attack by digestive agents than does new cheddar cheese.

F. P. UNDERHILL.

The Lecithin Content of Fatty Extracts from the Kidney. BY E. K. DUNHAM. *Science*, **20**, 79–80; also *Proc. Soc. Exp. Biol. and Med.*, **1**, 39–41.—The alcohol-chloroform extract from the kidney contains from 200 to 500 times as much phosphorus as the extract from the depot fat. The phosphorus from these extracts was found to be wholly organic in character. Protagon could not be detected even in 400 grams of the tissue. The most probable compounds containing the phosphorus are forms of lecithin. The barium hydroxide platinic chloride method for the separation of chlorine was employed with the following results:

	Extract. Grams.	Phosphorus. Per cent.	Lecithin. Gram.	Lecithin in extract. (Distearyl lecithin.) Per cent.
I.	0.4600	1.43	.....	37.23
	0.4600	1.47	.....	37.45
	1.5859	...	0.0650	34.50
II.	0.6032	1.12	.....	29.11
	0.6032	1.11	.....	28.99
	2.1556	...	0.0711	27.40

Assuming that the phosphorus content of the extracts obtained is dependent upon the presence of some form of lecithin, the author has calculated that in the human kidney of certain diseases the percentage of lecithin was as follows: Pneumonia, 6.29; tuberculosis, 4.02; moderately fatty kidneys, 4.76 to 4.80; beef kidney, 8.21; dog kidney, 7.95; rabbit kidney, 10.96.

F. P. UNDERHILL.

On the Secretion of Human Bile. BY PHOEBUS A. LEVENE, W. G. MELVIN AND B. MICHAILOWSKI. *Proc. Soc. Exp. Biol. and Med.*, 1, 33.—The bile was obtained from a patient with a biliary fistula. The patient had been operated upon for gallstones, and was in comparatively good health at the time of the experiments. Attention was directed to (1) the influence of the diet upon the quantity of bile secreted in twenty-four hours, (2) the permeability of the biliary ducts for certain substances like methylene blue and sodium salicylate, (3) the influences of these substances and of some salts and acids on the secretion, and (4) on the nature of the so-called "bile mucin." The quantities of bile secreted under different conditions, together with other data, are briefly summarized below:

Diet and dosage.	Volume in twenty-four hours. cc.	Total solids. Per cent.	Organic matter. Per cent.	Ash. Per cent.
Mixed diet	780	1.57	0.76	0.82
Animal diet	785	1.68	0.60	1.08
Milk diet	845	1.61	0.56	1.05
Vegetable diet	835	1.64	0.80	0.84
Sodium carbonate	461	1.62	0.71	0.92
Hydrochloric acid	461	1.53	1.08	0.45
Calcium chloride	687	1.63	0.56	1.08
Sodium salicylate	642	1.40	0.42	0.98
Methylene blue	864	1.58	0.54	1.04

For methylene blue and sodium salicylate the bile ducts proved less permeable than the kidneys. There was observed a marked increase in secretion after subcutaneous injection of methylene blue. The "mucin" was found to be a phosphorized proteid, but no purin bases could be detected in its molecule.

F. P. UNDERHILL.

On the Origin of Cholesterin in Gallstones. BY CHRISTIAN A. HERTER. *Proc. Soc. Exp. Biol. and Med.*, 1, 17.—According to the results of this research it is very probable that inflammatory conditions of the walls of the gall-bladder may lead to an increase in the cholesterin of the bile. Strong solutions of mercury bichloride were injected into the gall-bladders of dogs which had previously fasted for three days, and after periods of from three to five days the animals were killed. As a rule the gall-bladder walls were much thickened and the epithelium was proliferated and desquamated. The solids of the bile were diminished in percentage. The cholesterin content was much increased. The contents of the gall-bladder in these experiments were sterile. F. P. UNDERHILL.

The Palaeochemistry of the Ocean in Relation to Animal and Vegetable Protoplasm. BY A. B. MACCALLUM. *Trans. Can. Inst.*, 1903–04, pp. 1–36.—The composition of the ocean represents the result of the leaching action of the ocean on the land surfaces of the globe throughout all geological periods, and of the chemical and other agencies modifying or enhancing the power of sea water to retain in solution the mineral constituents derived from the land surfaces through river water since the beginning of the primeval period. The relative proportions of the elements, especially of potassium, calcium, and magnesium in river discharge are not parallel to those of the same elements found in the sea. In river water, the calcium is always more, and the potassium less abundant than the sodium, while the magnesium appears to approximate in amount the latter. In the sea, the sodium is much more abundant than the other three elements, and this is due to the continuous precipitation of a very great portion of the calcium added by rivers as carbonate, to the subsequent fixation in the limestone so formed of the magnesium as carbonate, and to the removal of potassium which is effected through animal and vegetable forms, and its consequent fixation in submarine deposits as glauconite and other potassium-holding minerals. The potassium and calcium appear to be stationary in amount, while the magnesium added by river water appears to exceed in amount that removed from the sea, and in consequence, is slowly on the increase in the ocean, but its rate of increase is far behind that of the sodium. The relative proportions of the elements in the ocean, have, therefore, always been changing, and these proportions must have been, in the earlier geological periods, very different from what they are now. In the ocean of the earliest period the relative proportions of the elements approximated those found in river discharge, or rather those found in fresh water from areas covered with Archaean rocks. In this the potassium approaches the sodium in amount, while the magnesium exceeds the latter, and the calcium is relatively very abundant. This condition must have continued until living forms made their appearance in the ocean when the gradual elimination of the magnesium, and particularly of the potassium and calcium began. The forms were in all probability unicellular, and as the period must have been of great duration, the organisms and their protoplasm acquired a fixed relation to the four elements. With the appearance of vegetable land forms and the formation of soils the removal of potassium from the soil to the sea by river water diminished, and this, in conjunction with the elimination of the element from sea water by organisms, made the amount in the sea stationary. Through the action of living forms the calcium also in sea water has been kept stationary since that remote period. In the transition of the more ancient composition to that of the present, the unicellular organism became multicellular, and developed circulatory systems, the vascular fluids of which were at first simply modified sea water. In the blood plasma of vertebrates, the three elements, sodium, potassium, and calcium are in relative proportions strikingly like those now obtaining in sea water. The magnesium only is considerably less than it is in sea water. The whole is due to heredity, the proportion of the saline constituents of the plasma being a reproduction of the proportions which obtained when circulatory plasmata were developed. The proportions of the four elements which obtain in living protoplasm are as yet unknown, for the latter has the power of precipitating the potassium, calcium, and probably the sodium and magnesium as inert compounds in itself or in its adventitious structures, and thus analyses would comprehend the inert material as well as the quantities of these elements which are actively participating in the processes of the living substance. If one could determine the latter quantities, one could regard them as a representation of the proportions obtaining in primeval sea water to which the protoplasm of unicellular organisms had established a fixed relation. That such a relation could be inherited may be inferred from the fact that the karyokinetic process, being practically the same in the animal and vegetable cell, has continued in both from ths primeval period when the karyokinetic process first developed in a parent unicellular organism neither distinctly animal or distinctly vegetable. This indicates how marked an influence heredity wields. Briefly, animal as well as vegetable protoplasm owes its relations to the elements, sodium, potassium, calcium, and magnesium to the composition of sea water which obtained when all forms were unicellular just as the blood plasma owes its relations to the same four elements to the sea water which prevailed when circulatory systems were established. In other words, the relation of protoplasm to salts is due to the action for ages of sea water, for incalculably long periods of time, on the living matter of unicellular organisms. F. P. UNDERHILL.

The Chemical Composition of Some Gorgonian Corals. BY FRANK C. COOK. *Am. J. Physiol.*, **12**, 95-99.—The following table, in which percentages are given, represents the results of the analysis of the corals examined :

Species.	Locality.	Loss at 110° C.	Composition of water-free substance.			Ash.	Composition of water and ash-free substance.		
			N.	I.	S.		N.	I.	S.
Gorgonia acerosa (pink)	Bermuda	11.0	15.75	1.94	1.03	5.09	16.5	2.0	1.08
Gorgonia flabellum (yellow and purple)	“	10.0	13.76	1.88	0.78	9.21	15.0	2.1	0.85
Plexaura flexuosa (dark purple)	“	9.0	12.88	4.95	1.31	12.40	14.5	5.6	1.47
“ “ “ “	“	8.9	11.73	4.63	1.26	7.76	12.6	5.0	1.35
“ “ “ “	West Indies	9.1	13.26	5.34	1.16	6.00	14.1	5.7	1.23
Plexarella crassa (gray)	Bermuda	9.7	13.27	2.48	1.46	12.34	14.9	2.8	1.64
Eunicea rousseaui (black)	“	8.6	13.26	2.17	1.46	....	....	..	....
Muricea muricata (yellow)	“	10.6	12.30	3.94	1.53	8.43	13.3	4.3	1.63
Muricea hebes (brown)	Panama	9.9	10.50	9.87	1.20	....	....	..	....
Leptogorgia rigida (dark violet)	“	11.8	10.30	1.55	0.96	30.00	13.5	2.0	1.24
“ virgulata (yellow)	North Carolina	10.6	8.67	1.82	0.84	....	....	..	....
“ “ (red)	Florida	10.1	8.30	0.42	0.92	40.97	11.7	0.6	1.29
Eugorgia aurantiaca (orange)	Gulf of California	11.4	7.10	1.50	0.78	....	....	..	....

Iodine was estimated by the method of Andrews, nitrogen by the Kjeldahl process, oxide of mercury being added to facilitate the decomposition; the ash was obtained by incineration, sulphur by the usual fusion with sodium hydroxide and potassium nitrate over an alcohol flame. Experiments were made to test the presence of mercaptan by the method of Bauer, but the result was negative. Evidence of carbohydrate groups was lacking.

F. P. UNDERHILL.

The Effect of the Intravenous Injection of Formaldehyde and Calcium Chloride on the Hemolytic Power of Serum. BY C. C. GUTHRIE. *Am. J. Physiol.*, **12**, 139–148.—Previous to the study of the influence of intravenous injection of formaldehyde and calcium chloride on the haemolytic power of the serum, a series of experiments was carried out in which the influence of certain factors (age, weight, sex, state of nutrition, breed, pregnancy, hemorrhage, asphyxia, excess of ether, and variations in temperature) upon the haemolytic power of the serum was determined. All these factors were found to have very little influence upon the haemolytic power of the serum. The dogs were etherized, samples of normal blood drawn, and the injection made into the jugular vein. Further samples were drawn at five-minute intervals—from 20–30 cc. for each. After coagulation occurred the clots were loosened and the samples placed in an ice box until a sufficient quantity of serum had separated. Washed corpuscles from the rabbit, pig and guinea-pig, were prepared by washing defibrinated blood with 0.9 per cent. salt solution, and then making a 5 per cent. suspension of the corpuscles in 0.9 per cent. sodium chloride solution. The sera and corpuscles were mixed and placed at 40° C. The injection of formaldehyde (60 cc. of a 1.0 per cent. solution in sodium chloride solution in a dog of 8.1 kilos) produces a moderate though decided decrease in the haemolytic power of the serum. The decrease is most marked in the serum from blood drawn immediately after the injection is finished. The decrease is quite distinct in serum from blood drawn fifteen minutes after the injection. The effect of the injection of calcium chloride (in amounts of about one part of calcium chloride to four thousand of blood) is much the same as that produced by formaldehyde except that the inhibition of the haemolytic power is greater for calcium chloride in the proportions injected than for formaldehyde. If dog's blood be mixed with calcium chloride before injection into rabbits, the haemolysinogen was either destroyed or greatly weakened, but this was not true of the agglutininogen.

F. P. UNDERHILL.

The Effect of Suprarenal Extract upon the Pupils of Frogs. BY S. J. MELTZER AND CLARA MELTZER AUER. *Am. J. Physiol.*, **11**, 449–455.—Subcutaneous injections of suprarenal extract have no effect upon the width of the pupils in mammals, and instillations into the conjunctival sac likewise exert no influence. In normal frogs a subcutaneous injection (0°.05–0.5 cc. adrenaline (1 : 1000)) readily causes a dilatation of the pupils that lasts even longer than that observed in mammals after removal of the superior cervical ganglion (Meltzer and Auer: *Am. J. Physiol.*, **11**, 28). The same is also true of instillations into the conjunctival sac. A dose of 0.1 cc. of adrenaline will generally have the same effect upon the pupils of a frog as a dose of 0.5 cc. and more. The latter dose will invariably cause a pronounced prostration of the animal while a dose of 0.1 cc. has no other perceptible effect upon the frog than the dilatation of the pupils. The dilating effect sets in three to eight minutes after the injection. The first effect was always observed to take place in the vertical diameter. Sooner or later, however, the horizontal also invariably becomes longer. The reaction to light was almost always absent. The dilatation was rarely a maximum one, as there remained all around a perceptible portion of the iris. The maximum effect lasted, in some cases, many hours; in others, only a comparatively short time. If the cord was severed just below the medulla oblongata, it often occurred that the pupils became very small. In such animals the effect of injections as well as of instillation was very marked, the pupils becoming much dilated. When the head was cut off at a line connecting the anterior borders of the ear-drum, instillation into the conjunctival sac brought out a prompt dilatation of the pupil. The dropping of adrenaline upon the corneal surface of excised eyes caused a prompt dilatation, which could be observed five hours later.

F. P. UNDERHILL.

The Elimination of Endogenous Uric Acid. BY ELBERT W. ROCKWOOD. *Am. J. Physiol.*, **12**, 38–55.—The view of Burian and Schur (*Arch. f. die gesammte Physiol.*, **80**, 241), that the endogenous components of the eliminated urinary purin compounds are constant for each individual has been tested in the present research. Studies have also been made on the influence of work, increased food materials and water. The general plan of the experiments was to select a diet from purin-free foods and to take the same kind and amount of food at the same time of day as long as the test lasted. The foods were also varied. The urine was analyzed for nitrogen (by the Kjeldahl-Gunning method), uric acid (according to Folin), phosphoric acid by titration with uranium acetate. On a diet of milk (1350 grams), "force" (35 grams), cream (50 grams), sugar (20 grams), oyster crackers (250 grams), cheese (30 grams), eggs (96 grams), apples (90 grams), wheat bread (25 grams), butter (15 grams), with a fuel value of 2770 calories, the subject eliminated during a nine days period an average of 0.311 gram of uric acid. With a slightly increased quantity of food the average output of uric acid was 0.301 gram. The same subject on a slightly different diet extending over seven days eliminated 0.305 gram of uric acid. The following table shows the daily averages of three subjects upon whom experiments were carried out over a period of several months.

SUBJECT A.

Days.	Nitrogen in grams.	Uric acid in grams.	P_2O_5 in grams.	Time.
9	11.99	0.308	2.41	Dec.-Jan., 1903.
7	11.58	0.305	2.86	Jan.-Feb., 1903.
10	11.15	0.315	2.21	March, 1903.
6	12.63	0.321	2.28	May, 1903.
8	12.68	0.313	2.49	July, 1903.
2	9.99	0.298	2.11	Nov. 1903.
		SUBJECT C.		
13	13.41	0.478	2.21	Jan., 1903.
10	13.92	0.452	2.49	March, 1903.

The following table shows the average output of uric acid of the different subjects on the same diet:

Subject.	Days.	Nitrogen in grams.	Uric acid in grams.	P_2O_5 in grams.
A	7	11.58	0.305	2.86
B	12	11.39	0.340	2.37
C	10	13.92	0.452	2.49
D	10	11.15	0.315	2.21

The individual factor in the output of uric acid on a purin-free diet is obvious. With subject A this varied far less than either the elimination of nitrogen or phosphorus. The excretion of endogenous uric acid may be temporarily increased by excessive exercise, but in spite of continued hard work it gradually sinks to the normal endogenous amount. The hourly elimination of uric acid was greater by day than by night. The explanation offered for this fact is that the cellular metabolism varies. Some results showing the elimination of uric acid in children are also given and it is seen that in proportion to the body weight the amount of endogenous uric acid eliminated is about the same as in adults. F. P. UNDERHILL.

The Influence of Alcohol in Biliary Secretion. BY WILLIAM SALANT. *Science*, **20**, 81–82; also *Proc. Soc. Exp. Biol. and Med.*, **1**, 42.—The injection of alcohol (4 cc. per kilo of 60 per cent.) into the femoral vein of fasting or well-fed dogs causes a diminished secretion of bile. F. P. UNDERHILL.

A Study of the Effects of Certain Stimuli, Single and Combined, upon Paramaecium. BY ELIZABETH W. TOWLE. *Am. J. Physiol.*, **12**, 220–237.—Paramaecia will live indefinitely in perfectly pure water. Immersion in water causes a variable degree of increase in the sensitiveness of the organism toward many chemical reagents. The constitution of the original culture—apart from its content of acid or alkali—and the time when an experiment is performed, are both factors in determining the reaction of Paramaecia to chemical and physical stimuli. The reaction of Paramaecia reared in acid, neutral, and alkali cultures varies but little qualitatively. Paramaecia become readily habituated to solutions in strengths which are soon fatal. Low temperature causes loss of water and condensations of the protoplasm. It also retards the action of the following substances upon Paramaecia: sodium hydroxide, sodium acetate, sodium citrate, sodium chloride, sodium sulphate, hydrochloric acid, calcium chloride, cane-sugar, urea. Of the above substances the effect of those with predominant anions is to liquefy the protoplasm, but the behavior of Paramaecia varies greatly according to the liquefying agent used. The primary effect of solutions containing predominant kations is to cause condensation of the protoplasm, but secondary effects may follow which tend toward liquefaction. Strongly osmotic solutions of cane-sugar and urea also have two effects: the first leads to loss of water and condensation, the second to swelling and disintegration of the protoplasm. By combining solutions whose effects are antagonistic, a variable amount of retardation can be obtained. A mixture of subfatal doses of apparently antagonistic substances may prove more fatal in its effect than either substance alone. Complete neutralization of the effects of antagonistic substances is never obtained.

F. P. UNDERHILL.

Ether Laking: A Contribution to the Study of Laking Agents that Dissolve Lecithin and Cholesterin. BY S. PESKIND. *Am. J. Physiol.*, **12**, 184–206.—For a given volume of any blood-suspension a definite per cent. of ether is required to produce laking. The cholesterin and lecithin extracted from blood corpuscles and suspended in saline requires a definite per cent. of ether for solution. The absolute volume of a blood-suspension is the total volume minus the volume occupied by the corpuscles. If one compares the per cent. of ether required to lake blood corpuscles suspended in saline, it is found to be the same as the per cent. of ether required for the solution of the cholesterin and lecithin of the corpuscles suspended in the same absolute volume. The conclusion may be drawn therefore that the solution of the cholesterin and lecithin from the corpuscles produces laking of the latter, since both processes require the same per cent. of ether. Pure cholesterin suspended in a given volume of saline requires for solution the same per cent. of ether as is required to lake blood corpuscles suspended in the same absolute volume. It may be concluded from this that the extraction of cholesterin from the corpuscles produces laking. Ether saturated with choles-

ı lakes blood just as though no cholesterin were dissolved . The same holds true for chloroform. Quantitative anal- shows that a small proportion of cholesterin and lecithin is ɔved from the corpuscles during laking. It is believed by author that the cholesterin and lecithin removed during ng is extracted from the envelopes of the corpuscles, and that ›enetration of the ether into the corpuscles occurs until these ;tances have been removed from the envelopes. When ether lded to a blood-suspension, some of the ether is absorbed by cholesterin and lecithin in the envelopes of the corpuscles.
F. P. UNDERHILL.

ıe Fate of Strychnine in the Intestine of the Rabbit. BY ERT A. HATCHER. *Am. J. Physiol.*, **12**, 236–241.—The ıor shows that the statement made by Salant (*Centrlbl. f. re Med.*, 1902, p. 1089, and *J. Med. Research*, 1904, p. 41) that caecum or colon of the rabbit contains a substance capable of roying strychnine is probably not strictly true and it seems ɔtful if any actual destruction of strychnine occurs under any lition. F. P. UNDERHILL.

ıhibition of the Action of Physostigmine by Calcium ›ride. BY SAMUEL A. MATHEWS AND ORVILLE H. BROWN. *J. Physiol.*, **12**, 173–176.—The injection of physostigmine grams per kilo) into the femoral vein of a dog under chloro- anesthesia, calls forth contractions of the intestines, tremors he voluntary muscles, and increased salivary secretion. If injection is followed by an injection of about twenty cubic imeters of an $\frac{m}{8}$ solution of calcium chloride, all the effects .uced by the injection of the physostigmine are counteracted inhibited. F. P. UNDERHILL.

ıe Influence of Chloroform upon Intravital Staining with hylene Blue. BY C. A. HERTER AND A. N. RICHARDS. *J. Physiol.*, **12**, 207–213.—The injection of methylene blue the vein of rabbits under the influence of chloroform causes ferent distribution of the dye than when similar injections nade into normal rabbits. This difference in distribution of dye is probably an indication that the chloroform intoxication tended by wide-spread disturbance of function in the organs tissues. F. P. UNDERHILL.

ydrolysis of Spleen-Nucleic Acid by Dilute Mineral Acids. ?. A. LEVENE. *Am. J. Physiol.*, **12**, 113–220.—In order to oach more closely to the chemical make-up of the nucleic acid :cule, Levene has subjected the nucleic acid of the spleen to ıction of dilute acid (2 per cent. sulphuric) in an autoclave at a temperature of from 100–120° C. for four days, and the resulting mixture (filtrate and residue) has been analyzed. In the filtrate were found guanine and adenine. The residue had a composition of nitrogen = 12.33 per cent., phosphorus = 11.33 per cent., thus agreeing well with the thyminic acid of Kossel and Neumann. In order to ascertain the relation of the substance to the original acid it was decomposed in an autoclave with 10 per cent. sulphuric acid for two hours and the resulting mixture analyzed. The pyrimidine bases were separated by the Kossel-Jones method and consisted of 0.2 gram of pure thymine and 0.225 gram of cytosine picrate. The substance in the nucleic acid molecule that yields furfural is nearly totally broken up by the treatment with a 2 per cent. solution of sulphuric acid. The yield of levulinic acid was larger than could be expected from a corresponding quantity of nucleic acid. It is further shown that the cleavage of nucleic acid by trypsine is very slow. F. P. UNDERHILL.

The Identity of So-called Ureine (Moor). BY H. D. HASKINS. *Am. J. Physiol.*, **12**, 162–167.—The ureine of Moor (*Le physiologiste russe*, 1900, p. 128), which was claimed to constitute a large proportion of the nitrogen of the urine, is found by the author to be a mixture containing a large amount of urochrome. The reactions which Moor believes to establish the existence of ureine are in reality characteristic reactions of urochrome.

F. P. UNDERHILL.

The Chemistry of Malignant Growths—the Inorganic Constituents of Tumors. BY S. P. BEEBE. *Am. J. Physiol.*, **12**, 167–173.—An estimation of the inorganic constituents (sulphur, phosphorus, iron, calcium, sodium and potassium and nitrogen) was undertaken with a view of determining whether a peculiar inorganic environment may have anything to do with the remarkable nutritional activities characteristic of neoplasms. The most interesting results of the analyses are found in the ratio which calcium, potassium and sodium bear to one another. In tumor tissues badly degenerated the quantity of calcium is large (1.20–1.44 grams of CaO per 100 grams of dried tissue) and the amount of potassium (0.5185 gram to 0.060 gram in 100 grams of dried tissue) and sodium (0.855 to 0.720 gram in 100 grams of dried tissue) is small, while in fresh, vigorous tumor tissues the quantity of calcium was small (0.09 to 0.14 gram in 100 grams of dried tissue), but the quantity of potassium and sodium was large (0.3831 to 1.625 grams of potassium and 0.4765 to 3.315 grams of sodium in 100 grams of dried tissue). F. P. UNDERHILL.

On the Combined Action of Proteolytic Enzymes. BY P. A. LEVENE AND L. B. STOOKEY. *Am. J. Physiol.*, **12**, 1–13.—The enzymes employed in this investigation were those contained in extracts of fresh organs—the liver, spleen, and pancreas. The extracts were prepared by mincing the organs up in 0.25 per cent. sodium carbonate solution (pancreas) or in physiological salt solution (liver, spleen), and allowing them to stand over night in a refrigerator with due regard to antiseptic precautions. The mixtures were filtered, and the filtrates employed in the experiments. In some of the experiments the glands were simply minced, taken up in sodium carbonate solution and thus were used for the investigation. When spleen and pancreas were allowed to act simultaneously on a foreign proteid—egg-albumin or casein—the quantity of the products resulting from their action was greater than the total sum of the products obtained by the digestion of equal quantities of spleen and pancreas acting separately. It was thus not a summation of two enzymes, but an increase in the digesting energy of one or both. However, from the results of some of the experiments the increased action might be attributed to the pancreas. Thus when three parts of pancreas and one part of spleen were allowed to act on a foreign proteid, the quantity of digestion products was greater than in the experiments where pancreas and spleen were taken in equal proportions or in proportions of one part of pancreas to three of spleen. Another experiment seems to add weight to this supposition. Fresh pancreas was allowed to stand under antiseptic precautions for forty-eight hours at room temperature. Fresh spleen was then added, and their combined action on foreign proteid was noticeably greater than an equal portion of pancreas similarly treated and an equal portion of spleen acting separately. Thus these experiments corroborate the view of Schiff, Herzen, and Mendel and Rettger, that the spleen facilitates the transformation of the pancreatic zymogen into the active enzyme. A similar action on the part of the spleen upon the proteolytic power of the liver could not be observed. The estimation of the quantity of the products of digestion was made by saturating a part of the mixture with zinc sulphate and another part with phosphotungstic acid. In the filtrates the nitrogen was determined. F. P. UNDERHILL.

On the Reducing Action of the Animal Organism under the Influence of Cold. BY C. A. HERTER. *Am. J. Physiol.*, **12**, 128–139.—When methylene blue (35-40 cc. of a 0.33 per cent. solution) is slowly injected into the jugular vein of rabbits, cooled to 10° below normal temperature by means of wet cloths, the reduction to leuco-methylene blue is not effected so quickly or so extensively as when a similar injection is made into normal rabbits. The fall in temperature of the animal body appears to diminish reduction just as a fall in temperature would tend to diminish the velocity of chemical reactions without the body. This observation is particularly striking in the case of the muscles, including the heart and diaphragm, and the gray substance of the central nervous system. F. P. UNDERHILL.

The Effect of Alcohol and Alcoholic Fluids upon the Excretion of Uric Acid in Man. By S. P. Beebe. *Am. J. Physiol.*, **12**, 13–55.—These experiments, which lasted from twelve to twenty days (during one-third of which alcohol in some form was taken), were carried out upon young men unaccustomed to alcoholic drinks and living upon a fixed diet throughout the experiment. When 50 to 80 cc. alcohol are taken daily, there is an average daily increase in the output of uric acid of 16 per cent. and a marked increase in the excretion of ammonia. Alcohol taken without food causes no increase in the output of uric acid. The strong diuresis caused by the taking of the alcohol has no influence upon the excretion of uric acid, a fact which speaks against the theory of sweeping urates out of the system by increasing the volume of water excreted. If 300 cc. of port wine were taken, the increase in the excretion of uric acid amounted to 46.5 per cent., and the purin bases, calculated as xanthine, were increased 42.5 per cent. Hourly experiments show that the increase of uric acid after the introduction of alcoholic fluids reaches its maximum five hours after the meal and alcohol have been taken. Some of the metabolism experiments give evidence of the proteid-sparing effect of alcohol; in one experiment the average daily nitrogen of the fore-period was 14.65 grams; of the alcohol period, 13.82 grams; of the after-period, 14.12 grams. The nitrogen was determined by the Kjeldahl-Gunning method; the uric acid by the Hopkins-Folin method; the ammonia according to Folin's earlier method (*Ztschr. phys. Chem.*, **32**, 585). F. P. Underhill.

Studies on Tuberculous Serum and the Bacteriolysis of Bacillus Tuberculosis. By Edward R. Baldwin. *J. Med. Research*, **12** (New Series 7), 215–235.—Specific differences may be recognized between the serum of calves which have overcome an intravenous injection of human tubercle bacilli and that of normal calves. These differences can be detected and measured for a period of four months after the inoculation by the following method: The method consists in mixing equal quantities of bacilli and the inactivated serums to be tested, incubating an hour and centrifugalizing. After decanting and discarding the inactive serums, a single active serum is added in equal amounts to each tube of saturated bacilli. These are again incubated an hour and centrifugalized. The supernatant serums are then added to the erythrocytes in graded doses for comparison of the hemolytic power. This test may reveal the presence of specific agglutinins for the tubercle bacillus. A long duration of the protection conferred on calves by human bacilli against inoculation subsequently by bovine bacilli is called in question by the results of this work.
F. P. Underhill.

Action of Pepsin Digestion on Tuberculin. By H. M. Kinghorn. *J. Med. Research*, 12 (New Series 7), 213–215.—Baldwin and Levene (*J. Med. Research*, July, 1901) have found that trypsin and pepsin digestions weakened the specific activity of tuberculin; that trypsin on prolonged digestion destroyed all the activity of tuberculin, while the same was not achieved by pepsin. They concluded that tuberculin is a specific substance of the nature of a nucleo-proteid, which would account for its being more easily destroyed by tripsin than by pepsin. Kinghorn has repeated the work of these investigators with pepsin and finds that in from six to ten days digestion with pepsin the toxin was totally destroyed, so that no fever and no local reaction occurred in any of the experimental rabbits. F. P. Underhill.

The Effect of Partial Starvation on the Brain of the White Rat. By Shinkishi Hatai. *Am. J. Physiol.*, 12, 116–128.—White rats in the growing stage were fed upon carbohydrates and fats, but were given no proteids. The experiments were continued for twenty-one days and the body weight was regularly determined daily before feeding. This partial starvation (exclusion of proteid) causes a loss of body weight, the greatest loss occurring during the first few days, and after that the daily loss is quite regular. The male rats lose during the starvation proportionally more than the females—32 to 27 per cent., respectively. A loss of brain weight of 4.8 per cent. in the older rats, and of 5.3 per cent. in the younger rats occurs during starvation. The percentage of water and of ether-alcohol extracts of the brain is affected to only a slight degree. F. P. Underhill.

Structural Changes of Ova in Anisotonic Solutions and Saponin. By Torald Sollmann. *Am. J. Physiol.*, 12, 99–116. —Anisotonic solutions cause decomposition and solution of the cytoplasm of ova (asterias, etc.), raising the osmotic pressure to such a degree that the cells may swell in hyper-isotonic solutions. It is suggested that the employment of anisotonic solutions may be useful in investigating the structure and composition of the cytoplasm, and the existence and permeability of cell-membranes. The behavior of the erythrocytes of annelids toward laking agents closely resembles that of the vertebrate corpuscles. F. P. Underhill.

Feeding Experiments with Cholalic Acid in Cystinuria. By Chas. E. Simons and D. G. Campbell. *Beiträge z. chem. Pysiol. u. Path.*, 5, 401–406.—The authors fed a cystinuria patient, a man in good condition and on a constant diet, doses of from 0.6 gram to 2.0 grams of cholalic acid per day, and analyzed the urine for total sulphur, oxidized sulphur, and neutral sulphur. The introduction of the cholalic acid had no significant influence upon the excretion of the different kinds of sulphur. It was the object of the investigation to test the validity of the supposition that in cases of cystinuria not enough cholalic acid was present to unite with the cystin, formed in the organism, to form a combination which by oxidation would be transformed to taurocholic acid. If this were true, the appearance of cystin in the urine could be readily explained, and, if necessary, stopped. From the results of the research no such conclusion could be drawn.

F. P. UNDERHILL.

On the Presence of Taurine in the Muscles of Molluscs. BY LAFAYETTE B. MENDEL. *Beiträge z. chem. Physiol. u. Path.*, 5, 582.—The presence of considerable quantities of taurine in the large muscles of *Sycotypus canaliculatus*, *Fulgar carica* and *Haliotis* ("Abelone" of the Pacific Coast) has been demonstrated. The taurine was obtained by crystallization from the watery extract after the separation of the proteids by coagulation, and the glycocol by alcohol.

F. P. UNDERHILL.

The Nature of Chemical and Electrical Stimulation. 1. The Physiological Action of an Ion Depends upon Its Electrical State and Its Electrical Stability. BY A. P. MATHEWS. *Am. J. Physiol.*, 11, 455–497.—Nearly all electrolytes and non-electrolytes will stimulate the sciatic nerve of the frog in solutions having an osmotic pressure of about fourteen atmospheres. This stimulation is not due to the electrical condition of the solution, since it is common to electrolytes as well as to non-electrolytes. It is not due wholly to the extraction of water increasing the concentration of salts in the outside of the nerve and setting up thereby a concentration chain, since the non-electrolytes stimulate nearly or quite as powerfully in such solutions as the electrolytes. This stimulation is probably due to the extraction of water setting up a definite change in the colloids of the nerve, rendering the protoplasmic hydrosol unstable. Many electrolytes stimulate in solutions which are so dilute as not to extract water. This stimulation is due to the electrical condition of the solution. All anions have a stimulating action ; all cations, a depressing action. This is shown by the facts adduced, as well as by the well-known phenomena of electrical stimulation, in which the opposite electrodes have opposite actions. The ions are minute, freely moving electrodes of different voltages. The physiological action of any ion depends : (1) on its concentration; (2) on the sign of its electrical charge ; (3) on its electrical stability or ionic potential. Its action is also modified by its weight and velocity : the faster it moves, the more powerful it is; the heavier it is, the less powerful. Physiological action is hence dependent upon the electrical state and stability of the ion and is independent of chemical composition, except as the chemical composition may influence its velocity and weight. Whether any salt stimulates or depresses, depends upon the relative efficiency of its anion and cation. If the anion markedly predominates as in hydroxides, the salt stimulates; if the cation predominates, the salt depresses. Numerical values for the different ions in normal concentrations may be computed from the following formula:

$$\text{Action} = \frac{V^2}{EW^{1/2}};$$

E = solution tension at normal concentrations; W = equivalent weight; V = velocity. The stimulating power of a salt may be represented as the ratio of the anion to the cation as follows:

$$\frac{V_a^2\left[E_c + \frac{0.057}{n}\log.\frac{1}{c}\right]W_c^{1/2}}{V_c^2\left(E_a + \frac{0.057}{n}\log.\frac{1}{c}\right)W_a^{1/2}}.$$

To this formula corrections must be made for speed of diffusion and dissociation. Certain exceptions, *i. e.*, caesium and fluorine, were noted but not explained. Chemical stimulation is thus shown to be electrical and dependent upon the electrical charges of the ions. Electrical stimulation is produced by modifying the distribution of ions in the nerve and thus altering their concentration, as Nernst suggested. F. P. UNDERHILL.

The Formation of Toxic Products by Vegetable Enzymes. BY C. A. BROWNE, JR. *Science*, 20, 179–181.—That germicidal products may be formed in sugar-cane juice by enzymes was shown as follows: Samples of the raw and ripe sterilized juice from sugar-cane were treated, respectively, with 0.2 per cent. resorcin, orcin, pyrogallol, and hydroquinone and left exposed to the air. In every instance the sterilized juices began to ferment first; as regards the raw juices those treated with resorcin and orcin showed the least resistance to fermentation, and those treated with pyrogallol and hyroquinone the greatest. The raw juice treated with hydroquinone turned nearly black and remained perfectly preserved for many weeks. In this case, the toxic agent was no doubt quinone, the presence of which was plainly ndicated by the odor. In the oxidation processes which take place through enzyme action when the tissues of green plants are cut or bruised, a quinone body may be formed, or perhaps, an organic peroxide of the asymmetric peracid type which latter group Freer and Novy (*Am. Chem. J.*, 27, 161–192) have demonstrated to be among the strongest germicides known.

F. P. UNDERHILL.

The Effect of Radium Rays on the Colon Bacillus, the Diphtheria Bacillus and Yeast. By S. C. Prescott. *Science*, 20, 246–248.—The growth of fresh cultures of *B. coli*, *B. diphtheriæ* or *Saccharomyces cerevisiæ* is not inhibited by being subjected to the rays of radium (estimated radioactivity of 1,500,000 units) at a distance of one centimeter for a period of time ranging from twenty to ninety minutes. F. P. Underhill.

On Guanase. By Walter Jones and C. L. Partridge. *Ztschr. physiol. Chem.*, 42, 343–348.—When pancreas is allowed to autolyze, under antiseptic precautions, in the presence of relatively large quantities (1.2 grams) of quanine hydrochloride the latter base is transformed into xanthine. The transformation is effected by an enzyme contained in the pancreas which the authors have called "quanase." This enzyme is not trypsine, since very active pancreas powder will not cause the transformation of quanine into xanthine. A similar enzyme exists in the thymus and adrenal glands, but is not present in the spleen (*Ztschr. physiol. Chem.*, 41, 101, and 42, 201). A study of the spleen shows that this organ contains an enzyme capable of transforming adenine into hypoxanthine. This enzyme has been called "adenase." It is evident that the products (quanine, adenine, hypoxanthine, and xanthine) obtained by Kutscher from a five months' autolysis of pancreas are products of hydrolysis rather than products of autolysis. F. P. Underhill.

On Inulin. By Arthur L. Dean. *Am. Chem. J.*, 32, 69–84.—Inulin obtained from the underground storage organs of *Dahlia variabilis*, *Helianthus tuberosus*, *Lappa minor*, *Inula Helenium*, *Solidago*, shows no essential differences. Inulin is accompanied in these places by levulins, resembling inulin in composition but differing from it in possessing a greater degree of solubility and a lower specific rotation. The specific rotation of inulin was found to be —38.6°. F. P. Underhill.

On the Origin and Precursors of Urinary Indican. By Frank P. Underhill. *Am. J. Physiol.*, 12, 176–184.—The researches of Ellinger, Scholz, and others have shown that there is at present insufficient evidence in support of the theory of Blumenthal and Rosenfeld that indican may arise from tissue decomposition within the organism, independent of the putrefactive processes of the intestine. The structure of tryptophane and its relation to kynurenic acid have been shown recently by Ellinger, and the work of Hopkins and Cole has demonstrated that the Adamkiewicz reaction of proteids is attributable to the presence of the tryptophane group in the latter. Various proteid substances yield this reaction with different degrees of intensity, some with negative outcome—the most familiar example being found in gelatine. If gelatine be made the chief nitrogenous constituent of the of a dog, the output of indican is much smaller than when ame quantity of nitrogen in the form of meat is fed (1.46– mg. indigo eliminated on a gelatine diet against 13.24–23.68 on a meat diet). The estimation of the indigo was according e method of Ellinger. F. P. UNDERHILL.

the Toxicity of Some Quinine Derivatives. BY REID T. *Arch. internat. de Pharmacodyn. et de Thérapie*, **12**, 506.—Certain compounds possess a double bond between two on atoms and at the same time are extremely toxic. Thus ine is twenty times as toxic as choline, and allyl alcohol is times more poisonous than propyl alcohol. Quinine, $OC_9H_5NC_8H_{12}N(OH)+CH=CH_2$, also has such a combi- n between two carbon atoms. The present experiments were ed out with a view of determining whether it was possible by inating the vinyl radical to form compounds which would re- the specific action of quinine upon the malaria parasites, and e same time be free from some of the detrimental effects as- ted with the quinine, or whether some of these derivatives t not have an action upon other diseases, caused by protozoa, lar to the action of quinine upon malaria. The compounds ied were hydroquinine, oxyhydroquinine, and hydrochlorqui- . Cinchoquinine was also employed. This substance still ains the vinyl group, but the hydroxyl group has been ged to a ketone group. The experiments were carried out mice, guinea-pigs, rabbits, and certain infusoria. The sub- ces were administered either subcutaneously or per os. From results of the investigation it is seen that the vinyl group has a slight influence upon the toxicity of the quinine molecule. ertain cases where the vinyl group was eliminated the toxicity e compound towards mice, rabbits, and guinea-pigs was a increased, while in one case (hydrochlorquinine) it was sig- antly reduced, this compound being hardly half as toxic as quinine. For the infusoria (hay infusions) hydroquinine and hydroquinine are less toxic than the quinine itself, but the rochlorquinine is much more toxic. Thus the addition of a rine atom decreases the toxicity for mammals and increases r certain protozoa—an observation which may prove of thera- tic value. F. P. UNDERHILL.

n the Toxicology of Some Nitriles and Their Antidotes. REID HUNT. *Arch. internat. de Pharmacodyn. et de Thérapie*, 447–496.—In the experiments communicated here the toxicity series of new cyanogen compounds has been determined upon te mice. The nitriles were injected subcutaneously, dissolved ater or alcohol. A second series was made in which the an- nistic action of different sulphur compounds has been studied. the purpose of comparison, determination of the toxicity of hydrocyanic acid was made. The fatal dose of this substance was found to be 0.05 mg. per gram of mouse. The fatal dose of acetonitrile was 0.7 mg. per gram of animal. Death usually occurs only after several hours, even with large doses. If a hydrogen atom is replaced by a hydroxyl group, the toxicity of the resulting compound, formaldehydecyanhydrin, is greater than that of acetonitrile, 0.015 mg. per gram of animal being sufficient to cause death. Chloralcyanhydrin is also very toxic, 0.023 mg. per gram of mouse giving fatal results. Benzonitrile causes death in doses of 0.18 mg. per gram of animal. If a CH_2 group be interposed between the benzene ring and the CN group, the toxicity of the cyanide formed is 0.032 mg. per gram of animal. The fatal dose of diethylaminoacetonitrile is 0.031 mg. per gram of mouse. The toxicity of this compound is greatly decreased by the addition of an iodomethyl group, the fatal dose of diethylaminoacetonitriliodomethylate being 0.25 mg. per gram of animal. Diethylaminolactonitrile has a toxicity of 0.022 mg. per gram of mouse, while that of diethylaminolactonitriliodomethylate is fatal in doses of about 0.4 mg. per gram. Phenylaminoacetonitrile has a toxicity of 0.055 mg. per gram of animal. Ortho- and metatolylaminoacetonitrile are fatal in doses of 0.091 and 0.1 mg. per gram respectively. The fatal dose of diethylaminophenylacetonitrile is 0.025 mg. per gram and that of piperidoacetonitrile is 0.050 mg. per gram of animal. Sodium nitro-prusside is fatal in doses of 0.012 mg. per gram. Experiments were also made in which the antagonistic action of certain sulphur compounds was determined. The poison and the antagonistic substance were injected simultaneously. It was found that sodium thiosulphate lessens the toxic effects of the various nitriles in varying degrees. Thialdine in alcohol or acetone solutions acts similarly, although the alcohol itself has a certain influence in this direction. The hydrochlorate of thialdine, carbothialdine, and potassium xanthate also act antagonistically to these nitriles.

F. P. UNDERHILL.

On Agglutination. BY B. H. BUXTON AND V. C. VAUGHAN, JR. *J. Med. Research*, 12 (New Series 7), 115–145.—In the present paper, attention has been mainly directed toward four points of interest, namely, variations in agglutinability, effect of simultaneous inoculations with different species of bacteria, effect of heat on agglutinating substances of the serum, and effect of heat on agglutinable substances of the bacilli. Most of the work was done upon the typhoid bacillus. The general conclusions of the work may be summarized as follows: Typhoid bacillus varies much in its agglutinability. This variability may be diminished by passage through animals without affecting the agglutinogenic power. In estimating the agglutinating value of the serum the agglutinable value of the bacilli must be taken into account.

taneous inoculation of various species of bacteria gives rise cific agglutinins for each. Agglutinins may be changed to :inoids by heating for thirty minutes at 65°–80° C.; above ie agglutinoids are destroyed. They reach their maximum C. Agglutinums are split off from the bacilli in broth cul and freshly made emulsions by heating to 70°–100° C. with eir activity being affected; they exist as free receptors. formalized emulsions, heating does not split off any agglu ; at 75° C. to 80° C. it is weakened, and at 100° C. is cally destroyed. A small proportion of the agglutinums, 'er, is not destroyed or split off by heating to 100° C. It e that these resistant agglutinums are changed to agglu oids on heating. It is probable that precipitins are iden vith the split-off agglutinums or free receptors.

F. P. UNDERHILL.

the Clotting of the Blood of Nephrectomized Rabbits. J. MELTZER AND WILLIAM SALANT. *J. Med. Research*, ew Series 7), 63–69.—After nephrectomy in rabbits the g of the blood is considerably delayed. The limit of delay ound to be seventy-five minutes, and seems to occur about to fifty hours after the nephrectomy.

F. P. UNDERHILL.

tudy on the Elimination of Strychnine into the Gastro inal Canal of Nephrectomized Rabbits. BY WILLIAM NT. *J. Med. Research*, 12, (New Series 7), 41–62.—The se of these experiments was to determine whether after re of the kidneys rabbits could eliminate strychnine by way intestinal canal. The injections were made one or two after nephrectomy and were continued at intervals of one ee hours. The quantity of strychnine injected at one time l from three to eight minims of a 1 : 1000 solution. rabbits received as much as 5.4 mg. per kilo. The its of the various sections as well as the entire gastro nal canal of such animals yielded no trace of strychnine examined by the Dragendorf, Otto-Stas, and Haines d. Strychnine added to the intestinal contents cannot be ed again. Strychnine added to the brain, liver, urine, ch, or small intestine could be detected. The conclusion is that vicarious elimination of strychnine into the gastro inal canal of nephrectomized rabbits is either slight or does cur at all.

F. P. UNDERHILL.

the Secretion of Acid by the Kidney. BY ARTHUR R. NY. *J. Physiol.*, 31, 188–204.—The author has endeav o throw light upon the mechanism of the renal activity in l in the secretion of the acid urine from the alkaline blood. eneral plan of the investigation was to provoke diuresis by the injection of various salts and sugar into the blood, and then to determine the conditions in diuresis under which the reaction of the urine approximated that of the blood or normal urine. By this means it was hoped that the change in reaction during diuresis might help to explain the normal secretion of acid by the kidney. The experiments were performed on dogs under morphine-chlorotone anesthesia. Cannulae were inserted in the ureters and in order to compare the reaction in diuresis of different degrees, under the same conditions as regards the blood, the amount of urine on one side was limited by inserting a resistance to the flow along one ureter (for method see *J. Physiol.*, **28**, 431). Besides determining the acidity by (N/10 potassium hydroxide and phenolphthalein, and litmus) determinations were made of the chlorides, sulphates, phosphates, carbonates, and sugar. The salts examined were the chloride, bromide, nitrate, sulphate, malate, and tartrate of sodium with which may be associated glucose, which gave similar results. These were injected in large amounts (300–500 cc.) and in concentrated solutions—normal solutions of the chloride and sulphate, and 10 per cent. solutions of the others. These salts induce a diuresis in which the urine is almost neutral to phenolphthalein and may be distinctly alkaline to litmus. In a second series of experiments when sodium phosphate (Na_2HPO_4) was injected alone or with glucose or sodium chloride the urine on the unobstructed side was strongly acid to phenolphthalein and the quantity of potassium hydroxide necessary to neutralize it was comparable to that required by normal dog's urine. On the obstructed side the acid character was much more pronounced. The results of the investigation indicate that the essential factors in the secretion of acid urine are the presence of certain salts, notably the phosphates, in sufficient amount, and a sufficient absorption by the renal tubules, this condition being also satisfied by the phosphates but not by carbonates or borates.

F. P. UNDERHILL.

Studies on the Tuberculin Reaction. BY E. L. TRUDEAU, E. R. BALDWIN AND H. M. KINGHORN. *J. Med. Research*, 12 (New Series 7), 169–171.—The injection of tubercle bacilli into the cornea of the eye of rabbits, followed by the subcutaneous injection of tuberculin, shows that no spread of the disease in the cornea could be observed. Extirpation of a tuberculous focus in the eye was followed by loss of reaction-susceptibility in the one rabbit in which the operation was successful. It is indicated that specific tubercles are necessary to a local tuberculin reaction. When capsules containing tubercle bacilli are introduced into the peritoneal cavity no signs of local reactions could be found about the capsules. The temperature elevations gave no certain evidence of susceptibility to tuberculin resulting from the presence of the bacilli in the capsules. Temperature and local reactions nay occasionally result from the injection of trypsin, peptone, nd sodium cinnamate. Atropine produced no reaction in moderate loses. The direct action of trypsin upon tuberculous abscesses ailed to produce reactions, and thus does not favor the enzyme heory of the tuberculin reaction. An attempt was made to determine what constituent of the tubercle bacillus induces reaction-susceptibility in the animal. Two methods were tried in the attempt to emove the reaction-susceptibility; first, by the injection of bacilli reviously exhausted in the preparation of the tuberculin and by oiling in water, and second, by injection of bacilli thoroughly xtracted with alcohol and ether. The results were not positive, s the bacilli probably still retained enough active substance to roduce susceptibility. The nuclein substance of the bacilli was nore abundant in the fat-extracted bacilli, and it is suggested hat the nuclein may produce reaction-susceptibility independently of the fat. F. P. UNDERHILL.

On the Biological Relationship of Proteids. BY P. A. EVENE. *J. Med. Research*, 12 (New Series 7), 194–204.—It vas the object of this research to establish the degree of specificity f precipitating serum in order, if possible, to establish a biological elationship between proteids. The individual substances used vere casein, milk-albumin, beef serum-albumin, beef serum-globulin, hog serum, albumin and globulin, egg albumin, egg lobulin of the duck and of the hen; milk, serum, white of the gg and yolk of the egg. The animals employed for the purpose f injection were rabbits, and they received from six to eight injections with intervals of two days. The first injections were iven subcutaneously, the last three interperitoneally, and the olutions contained about 2 per cent. of proteid. The injections vere begun with 5 cc., and were gradually increased to 10 cc. of he respective solutions. The serum of the animals that had received injections of milk formed precipitates with proteids of different tissues of the beef, as well as with milk and blood serum, ut did not precipitate any of the proteids of the fowl. The erum of the animals that had received milk albumin injections cted in the same manner. No marked precipitate was formed vith serum globulin or with paramysinogen. The precipitating ower of the serum of animals that had received injections of asein was more limited, as it formed precipitates only with the roteids of the milk, as well as with entire milk. The serum of nimals that had received injections of the white of the egg, and f egg globulin formed precipitates with the different proteids of he fowl and with none of the tissues of the beef. It thus seems hat proteids of different species are distinct in their biological ction on a living organism; that different proteids of the same nimal, or of animals of the same species, have a certain degree f similarity in their biological behavior. The serum of animals that had received injections of proto-albumose also gave precipitates with deutero-albumose and likewise the serum of animals that had received injections of deutero-albumose formed precipitates with both proto- and deutero-albumose.

F. P. UNDERHILL.

On the Production of Hemolytic Serum by Injecting Animals with Different Constituents of Erythrocytes. BY P. A. LEVENE. *J. Med. Research*, **12** (New Series 7), 190–194.—The injection of different constituents (extracts containing chiefly mineral salts, pure hemoglobin, ethereal-alcohol extracts, proteids of the stromata soluble in different salt solutions, and an extract of the erythrocytes in one-half per cent. solution of sodium bicarbonate) of the erythrocytes of dog's blood into rabbits fails to cause the serum of the latter to assume hemolytic properties with the exception of the sodium bicarbonate extract. With this extract the serum of animals that had received injections (about five injections of 10 cc. each) immediately showed some hemolytic power. If the injections were continued with intervals of two days until their total number reached ten, the serum acquired a strong hemolytic power; no perceptible, agglutinating power, however, was acquired. If erythrocytes are digested with trypsin for twenty-four hours, the injection of the filtrate obtained after neutralization produces a serum having hemolytic power in approximately the same degree as the serum of animals injected with sodium bicarbonate extract of the erythrocytes, while the animals injected with the pepsin-digested erythrocytes develop in their serum a much lower degree of hemolytic power; nor was any agglutinating power observed in the serum of these animals.

F. P. UNDERHILL.

Effect of Bacillus Mycoides xiii on Local Tuberculosis. BY H. M. KINGHORN. *J. Med. Research*, **12** (New Series 7), 249–251.—Subcutaneous injections of bacillus mycoïdes xiii do not show any beneficial influence on the local tuberculosis of the rabbit's eye. Subcutaneous injections do not produce any local reaction on the tuberculous eyes of rabbits. Moderate fever reactions always follow the injections. The blood serum of rabbits treated by it did not agglutinate Koch's test emulsion of tubercle bacilli, and this would indicate an absence of specific action on the tubercle bacilli. The blood serum of rabbits treated with mycoïdes xiii bacilli, agglutinated an emulsion of these bacilli in high dilutions.

F. P. UNDERHILL.

Anti-tuberculin or Tuberculin-precipitin Serums. BY E. R. BALDWIN. *J. Med. Research*, **12** (New Series 7), 235–343.—Specific precipitin serums (rabbit) for tubercle bacillus extract (five-tenths of 1 per cent. sodium bicarbonate) or solutions of tuberculin (made according to Koch's method of alcohol precipitation) precipitate a small proportion of reacting substance from such solutions. Increasing the amount of serum to a great excess fails to increase the amount of precipitate from the same amount of tuberculin. The precipitate was insoluble in all proportions of neutral saline solutions. Suspensions of the precipitate did not cause local reactions, and generally failed to produce fever in tuberculous rabbits. The precipitate was soluble in weak sodium hydroxide and proved capable of producing both temperature and local reactions when in solution. The weakening of reacting power produced by these serums was not appreciable in the experiments because enough tuberculin always remained in the serum-tuberculin mixtures to produce reactions after the precipitate was removed; moreover, rabbits are not suited to such tests, owing to their variable temperature. F. P. UNDERHILL.

On the Bio-chemistry of the Bacillus Tuberculosis. (Second Communication). BY P. A. LEVENE. *J. Med. Research*, 12 (New Series 7), 250–259.—Pulverized bacilli, treated with alcohol and benzene, afford an extract from which there separates, on standing, a light yellow precipitate, which, after purification and drying, is obtained as a white solid mass having a wax-like appearance. It has a composition of $C_{12}H_{24}O_3$ and melts at 55°–60° C. The molecular weight was not determined, and its chemical nature remains unknown. It can not be saponified by any known means of saponification. Attempts were made to saponify it by the serum of normal rabbits, and of the rabbits that had received subcutaneous injections of the waxy substance, but with negative outcome for the lipolytic action of the rabbit's serum had no influence on the fat of the tubercle bacilli. An analysis of the nucleic acid of the tubercle bacillus by the usual methods of the author shows that this nucleic acid is composed in a manner similar to that present in the animal cell. Thymine, uracil and probably cytosine, were isolated among the decomposition products. F. P. UNDERHILL.

On the Anti-Hemolytic Action of Some Cell and Tissue Constituents. BY P. A. LEVENE AND E. R. BALDWIN. *J. Med. Research*, 12 (New Series 7), 205–213.—Rabbits' serum digested with large quantities of tubercle bacilli from human source, dead or alive, does not lose its hemolytic power entirely, provided it is digested for less than an hour; if digested more than an hour it is rendered inactive, but only if a sufficient quantity of the bacilli is added. Attenuated cultures of tubercle bacilli, dead or alive, showed no difference of action. In experiments with virulent cultures (generally grown from four to five days) it was observed that the inhibitory power of the dead and living micro-organisms differed markedly. Thus rabbit serum digested with dead, virulent bacilli had no lytic power for the erythrocytes of the guinea-pig while the same quantity of the serum treated with living micro-organisms was still lytic for the erythrocytes, though not in the same degree as normal, untreated serum. These results were obtained only when the time of digestion did not exceed one hour. The author offers the suggestion that the inhibitory action of a cell on the lytic power of a serum is due to the action of some chemical substances normally composing the cell—some constituents readily soluble in the body liquids. In order to test the validity of this assumption various tissue constituents were allowed to act on rabbit serum, and the hemolytic power of the latter tested for the erythrocytes of the guinea-pig. The substances employed were liver glycogen, glycogen of the tubercle bacillus, a polysaccharose of the spleen, white of the egg, an extract of tubercle bacilli in five-tenths of 1 per cent. sodium bicarbonate (the extract contained no bacilli), a sodium salt of pancreas nucleic acid, a sodium salt of tuberculinic acid, proto-albumose, proto-gelatose, and a coagulable paranucleic acid. A serum digested for about two hours with any of these products entirely loses its hemolytic power. They do not all possess the same degree of inhibitory power. With respect to the mechanism of the inhibitory power of the cell constituents it has apparently to do with the complement for the most part. Digestion with tissue constituents has no effect on the agglutinating power of a hemolytic serum. F. P. UNDERHILL.

On the Intermediary Metabolism of the Purin Bodies: The Production of Allantoin in the Animal Body. BY LAFAYETTE B. MENDEL AND BENJAMIN WHITE. *Am. J. Physiol.*, **12**, 85–91.—The intravenous injection of uric acid (urates) in the cat and dog, like the injection of nucleic acid salts, gives rise to an excretion of allantoin in the urine. This result was more constantly observed when the uric acid was introduced in the portal vein than when it was injected directly into a peripheral vein. In control trials (with lithium chloride) the findings were either negative or else far less pronounced than those noted after the injection of uric acid. The observations after the injections into the rabbit were negative with regard to allantoin excretion, as were feeding experiments with purin bodies. The excretion (and probably the formation) of allantoin is markedly interfered with by certain drugs. Dogs subjected to sulphonal intoxication excrete considerably less allantoin after urate injections than more normal animals do. In the deranged condition induced by sulphonal, the canine organism furnishes only a slight output, if any, of allantoin after the injection of nucleins which yield a large quantity in healthy dogs. Thus, further evidence is afforded of the probable genetic relation of the liver to allantoin.

F. P. UNDERHILL.

The Relation of Mass Action and Physical Affinity to Toxicity, with Incidental Discussion as to How Far Electrolytic Dissociation May Be Involved. By J. B. Dandeno. *Am. J. Sci.*, 17, 437–459.—The solutions used in the present research were acid, base and toxic salt, and the seedlings employed were *Zea mais* (common field corn), *Pisum sativum* (small field pea), and *Lupinus albus* (white lupine). The question of the death of the seedlings was decided by placing the seedling in water after it had stood twenty-four hours in the solution whose toxicity was being tested. If the seedling grew, it was considered living. From the results of the investigation it is clear that the quantity of the solution bears certain relations to toxic action. The rate of diffusion also plays a significant part. The effect of the quantity of the toxic solution (hydrochloric acid or sulphuric acid) is evident when it is shown that if a gram-equivalent solution be diluted to N/1024 and divided into quantities of 1 cc. each and a seedling placed in each they would all grow: but if divided into quantities of 2½ cc. each and a seedling placed in each they would all die. Similar results were obtained for all the compounds and seedlings, the concentration causing death, depending upon the quantity employed. Non-chemical bodies, such as sand, retard very materially the toxic action of a solution in bringing about death to a seedling. The action upon the seedling is very probably of a chemical nature. The toxic effect of carbon dioxide is very low, killing the radical of the pea at N/342 but not the corn nor the lupine in any concentration which it was possible to obtain (N/171). F. P. Underhill.

On the Fate of Potassium Myronate in the Animal Organism and Its Hydrolysis by the Ferments of the Liver. By J. W. Kastle and Eloise Chesley McCaw. *Am. Chem. J.*, 32, 372.—Since the tissue and aqueous extract of nearly every plant examined possess the power to hydrolyze amygdalin, whereas myrosin is confined to relatively few plants, it seemed of interest to test whether potassium myronate could be hydrolyzed in the animal body. This is of more interest as it is known that the animal body possesses an emulsin. Potassium myronate, when injected subcutaneously into rabbits in doses of 0.5 gram per kilo, is without toxic effect and passes into the urine for the most part unchanged. This is in harmony with the behavior of nearly all the other complex carbohydrates and glucosides in that they are not directly assimilable from the blood. Given per os (0.5 gram per kilo) potassium myronate causes lethargy and loss of weight, but the glucoside is hydrolyzed as is evidenced by the failure to find any potassium myronate in the urine. It would seem then that the glucoside is assimilated when taken by the mouth. Extracts of the liver (hog, beef, dog, cat, hen, rat, mouse, sheep, frog) in contact with potassium myronate also have the power to cause this hydrolysis. Liver of the fish does not have this power. Neither do any other organs examined (pancreas, muscle, spleen, kidney, lung, mucous membrane of the small intestine of the dog). It is probable that the hydrolysis of this glucoside takes place in two stages, the first of which results in the splitting-off of glucose, the second in the further breaking-down of the residue into oil of mustard and potassium acid sulphate.

F. P. UNDERHILL.

PHARMACEUTICAL CHEMISTRY.

Acetic Acid Extracts. BY A. R. DOHME. *Pharm. Rev.*, 22, 345.—A cheaper solvent than alcohol for fluid and solid extracts has been sought for some years. For this purpose some manufacturers have advocated the use of acetic acid. In addition to its high price, alcohol is objected to because of the undesirability of administering it in certain diseases. The principal difference between acetic acid and alcohol is that the acid does not extract fats and oils, and the alcohol does not extract gums, starches, pectins, and similar bodies. Alcohol extracts the active principles of all drugs, which assertion cannot be made for acetic acid. While the latter leaves the oil in the marc, it does remove large amounts of extractive matters, loading the fluid preparation with inert matter, makes a syrupy, dense liquid, less palatable and more liable to occasion incompatibilities when mixed with other liquids. The inert extractive matters can be precipitated and separated from the acetic acid extract by the addition of alcohol. This adds to the expense for both labor and material, so why not use alcohol as menstruum in the first place? The acetic acid menstruum being largely water, causes the drug to swell to such an extent as to seriously interfere with the process of percolation. A number of laboratory experiments are cited by which it is sought to prove that the active principles of certain drugs are hydrolyzed or decomposed by the acetic acid. W. H. BLOME.

Determination of Codeine in Opium. BY C. E. CASPARI. *Pharm. Rev.*, 22, 348.—Until 1903 no method for the quantitative determination of codeine in opium was published. The various reference books state that opium contains from 0.2 to 0.6 per cent. of this alkaloid, which statement appears to have originated with manufacturers of codeine and is the percentage obtained by them on a large scale. As it is impossible for them to obtain all of the alkaloid present, these figures are, perhaps, not entirely correct. In 1903 Van der Wielen published a method for the determination of codeine and narcotine. For the estimation of the former he uses but 3 grams of opium, later extracts with a quantity of ether of which he finally takes an aliquot portion. In three samples of opium he found respectively, 1.08, 1.29, and 1.51 per cent. of codeine. The author proposes another method, more lengthy and complicated than Van der Wielen's. He operates upon 50 grams of drug, extracting it with water, evaporating this extract to 250 cc. and precipitating the meconic acid and resin with barium acetate, which process, after filtering, is repeated until the reagent no longer causes precipitation. An excess of sodium hydroxide is added to the solution, which precipitates thebaine, narcotine, and papaverine. The filtrate is made acid and evaporated. Ammonia is then added in excess, causing the precipitation of most of the morphine, the remainder being separated by a second similar treatment. The alkaline solution is then extracted with benzene, which removes the codeine but not narcotine, and the solvent evaporated. As the residue was colored and not crystalline, the alkaloid was determined by titration. Two estimations with the same sample of opium yielded 1.12 and 1.33 per cent. of codeine. W. H. BLOME.

Some Green Preparations. BY M. I. WILBERT. *The Pharm. Era*, **32**, 320.—Many people judge the quality or strength of a preparation by its general appearance and color. For this reason many preparations are colored to suggest some desirable quality to the credulous. Of the various colors used, green is the most desirable in certain cases, and chlorophyll the least objectionable of the coloring-agents, though expensive and not always available. Although not generally known, the seed coat and outer hull of the hemp seed yield to strong alcohol a considerable amount of green coloring-matter. A stock tincture may be made by macerating 25 parts of ground hemp seed with an equal amount of strong alcohol, then transferring to a percolator and extracting with more alcohol until 100 parts of tincture are obtained. This intensely green solution may be used for coloring alcoholic solutions, essential oils and soap solutions. The application of this tincture is shown by formulas for an oleated methyl salicylate, liniments, soap and elixirs, all of which may be colored green with this preparation. W. H. BLOME.

Volumetric Estimation of Phenol. BY F. X. MOERK. *Am. J. Pharm.*, 76, 475.—When estimating phenol in the usual way, by the action of bromine upon carbolic acid in the presence of sulphuric or hydrochloric acid, adding potassium iodide and then titrating with sodium thiosulphate, the tribromphenol formed interferes to some extent with the end reaction, especially if the phenol be old. This difficulty may be overcome by adding about 1 cc. of chloroform, which dissolves the tribromphenol, after most of the color has been discharged by the thiosulphate.

Starch indicator deteriorates very rapidly. This may be prevented by adding to a liter of the solution prepared in the usual way, 2 cc. of oil of cassia and mixing thoroughly. The oil has not been found to be objectionable so far in either qualitative or quantitative work. W. H. Blome.

Improved Process for Solution of Magnesium Citrate. By E. Brunor. *Merck's Rep.*, **13**, 291.—The suggested improvement lies in the preparation of a concentrated stock solution of magnesium citrate, which will remain unaltered for a month or more, if kept upon ice and in completely filled and sterile bottles. When it is desired to dispense a bottle of the solution, take 90 cc. of the concentrated preparation, add 60 cc. of syrup and then a sufficient quantity of cold carbonated water from the soda fountain to make 360 cc. The use of carbonated water does away with the potassium bicarbonate as well as with an equivalent amount of citric acid, and is said to yield a more palatable preparation. W. H. Blome.

Nitroglycerin and Its Assay. By F. W. Moore and L. E. Sayre. *The Drug. Circ.*, **48**, 218.—Nitroglycerin in the form of its spirit is a very active preparation, and as assay methods for most of the more active drugs and preparations are being demanded, we ought to have a simple and rapid method for the estimation of this article. Many processes have been suggested, one of which consists in converting the nitrogen into ammonia, distilling this into a volumetric acid solution and calculating the amount of nitroglycerin from the amount of ammonia formed. The results obtained by the authors, according to this method, were too high. The simplest method, which yielded at the same time the most satisfactory results, is that suggested by the late Dr. Charles Rice, and depends upon the saponification of the nitroglycerin by means of alcoholic potash of known strength, and upon the calculation of the amount of nitroglycerin present from the amount of alkali required. Three molecules of the latter are required to decompose one molecule of nitroglycerin, according to the equation: $C_3H_5(NO_3)_3 + 3KOH = 3C_3H_5(OH)_3 + 3KNO_3$. Therefore, each cc. of decinormal potassium hydroxide solution is equivalent to 0.00755 gram of nitroglycerin.

The following is given as a delicate qualitative test for nitroglycerin: Extract the liquid with ether or chloroform, add two or three drops of aniline on a watch-glass and evaporate. Then add a few drops of concentrated sulphuric acid, when a purple coloration, changing to dark green on dilution with water, will appear, if nitroglycerin be present. This test will reveal the presence of $^1/_{1000}$ of a grain. W. H. Blome.

Some Drug Adulterations. By Adulteration Com. *Mich. State Pharm. Assn.* By J. O. Schlotterbeck, Chairman. *The Drug. Circ.*, **48**, 221.—Because of the scarcity of hydrastis, the price has nearly trebled, and this has disposed some to partially

npletely exhaust the rhizome of hydrastine. Of twenty
s assayed, the poorest contained 0.64 per cent. and the best
er cent., nine samples yielded less than 2 per cent., eleven
s yielded between 2 and 3 per cent., and two samples
l over 3 per cent. of hydrastine.

frequently stated that commercial powdered cubeb berries
een deprived of their oleo-resin. The ten samples examined
ned from 19.38 per cent. to 25.0 per cent. of oleo-resin, the
e being 21.73 per cent. Thirty-nine samples of powdered
ound elm bark were obtained from as many different sources
amined microscopically for adulterants, and according to
ger's test, for mucilage. The latter consists in shaking ten
of powdered bark with one fluid ounce of water. If the
e a good one, a mucilage of such consistency will be formed
t will scarcely flow. Sixteen of these samples contained
starch, some in small quantity while others were grossly
rated with wheat and rye starch and even with wheat
ngs or middlings. Ten of the samples yielded little or no
ge, while a number of others gave a very thin one, scarcely
nt to suspend the fibers of the drug. The latter condition
e due to the collection of the bark at improper seasons.

samples each of tincture of iodine, spirit of camphor, and
re of arnica had wood alcohol only as solvent. Several
s of glycerin were examined and found to be above suspi-
One sample out of six of lycopodium was loaded with po-
arch. Two samples of unsweetened chocolate contained
15 per cent. of wheat middlings. Nine samples of balsam
aiba out of forty-six were adulterated with gurjun balsam.
l samples of *cannabis indica* were found to be without
logical action. W. H. Blome.

SANITARY CHEMISTRY.

ecision Concerning the Glover Sewage Disposal Patent.
Record, 50, 401–403.—The American Sewage Disposal Com-
claimed to hold patents that covered the use of any form
tic tank in the disposal of sewage, and in 1903 brought suit
t the City of Pawtucket, R. I., for using tanks in which
-called septic action took place. The decision of the court
avor of the City of Pawtucket. The opinion given by the
is very clear and emphatic, as is shown by the following
ces: "The evidence upon which the complainant relies to
that Glover made the important discovery that the solids
ge could be disposed of, through liquefaction, is far from
ctory or convincing. I am of the opinion that the com-
nt has failed to show that Glover had any such knowledge

of the necessary conditions for producing a true septic action as entitled him to be called a pioneer in that branch of the modern art of sewage disposal which intentionally employs putrefactive action as an agent in the disposition of sludge." "In my opinion, the patent does not, either directly or by fair implication, describe or claim the combination of putrefactive and oxidizing processes, nor the use of putrefactive action to reduce sludge; nor does it describe primary tanks suitable or intended for the production of this action, to any substantial extent." "The use of putrefactive action to liquefy solids is not an infringement of anything described or claimed in the patent, or proved to be substantially involved in any operation of the patented structure intended by the patentee." LEONARD P. KINNICUTT.

Note.—A suit has lately been brought by the Cameron Septic Tank Company, of Chicago, against Saratoga Springs, N. Y., for the use of a closed tank with submerged inlet and outlet. LEONARD P. KINNICUTT.

The Treatment of Water Containing Much Vegetable Matter. BY OSBERT CHADWICK AND BERTRAM BLOUNT. *Eng. Record*, 50, 427.—Tropical surface waters often become so offensive from the products of vegetable decay as to become undrinkable. The offensive substances in these waters can, according to the authors, be removed by treating the water with iron according to the Anderson process, and then thoroughly aërating the water. The usual method of allowing the water to fall over terraces or cascades is not sufficient. After many experiments, the simple device of allowing the water to fall in thin cylindrical streams for a distance of 6 feet was found to completely saturate the water with oxygen. To accomplish this purpose the water is caused to flow through holes 0.04 inch in diameter under a head of 8 inches. The rate of flow per hour per hole, under the above head is 0.87 Imp. gallons per hour. The improvement effected in the water of the Natrobi River in Uganda by the above process is shown by the following analyses:

	Parts per 100,000.	
	Before.	After treatment.
Free ammonia	0.020	0.112
Albuminoid ammonia	0.020	0.004
Oxygen absorbed in four hours	0.200	0.010

LEONARD P. KINNICUTT.

Experiments in Purifying Brewery Refuse. BY H. MACLEAN WILSON. *Eng. Record*, 50, 422–423.—The experiments were made with the brewery waste at Rotherham, England. The effect of the septic tank treatment was thoroughly tried for three months. The process causes most offensive odors and does not produce an effluent free from acidity, which is a great hindrance to further bacterial treatment. The sludge remaining in the tank is of a most offensive character, but alkaline. The crust consists mainly of spent grains and hops. The chief good effect is the removal of suspended matter, which can be better obtained by other methods. In the experiments with chemical treatment it was found that a neutral or alkaline effluent could not be obtained by the use of any reasonable amount of lime, if the waste yeast discharge was allowed to enter the tank. If this discharge was not allowed to enter the tank, and the sludge frequently removed, 45 grains of lime in the form of milk of lime per Imperial gallon was generally sufficient to keep the effluent alkaline. The amount of sludge produced was very large, but it was not so offensive as the sludge of the septic tank. The effect of double contact beds filled with coke was unsatisfactory, giving an acid effluent, when the alkaline effluent of the chemical precipitation tanks was run on the beds. Beds containing screened cinders, or screened cinders and limestone clippings, gave a neutral effluent, but otherwise little purification. Sand filters were also found to be unsatisfactory but if the effluent from the cinder filters was spread over a bed filled with coke about 2 inches in diameter by a sprinkling arrangement, good results could be obtained. The effluent from the coke bed contained suspended matter which could be satisfactorily removed by rapid filtration through a sand bed. The united effect of chemical treatment, double contact beds filled with cinder, percolation through coke, and sand straining gave very satisfactory results. The chemical treatment reduced suspended solids from 24.8 to 13 parts per 100,000, and the albuminoid ammonia from 3.8 to 1.8 parts. The double contact beds reduced the albuminoid ammonia from 1.8 to 0.7 and the oxygen absorbed from 32.7 to 7.9 parts. The united effect of the percolating coke filter, and the sand-straining beds reduced the albuminoid ammonia from 0.7 to 0.15 and the oxygen absorbed from 7.9 to 1.8 and nitrates were found to be present.

LEONARD P. KINNICUTT.

The Passenger Car Ventilation System of the Pennsylvania Railroad Company. BY CHARLES B. DUDLEY. Penn. R. R. Co., Altoona Pa., 1904, 24 pp.—This paper gives an account of experiments that have been made by the Pennsylvania Railroad Company to improve the ventilation of the passenger car service. According to the best authorities, if the air is not to have the slightest odor of a close inhabited space, the amount of fresh air added per person per hour to such space must be 3000 cubic feet. As an ordinary passenger car has about 4000 cubic feet of space, and is intended for 60 passengers, the amount of fresh air that would have to be taken into the car would necessitate changing the whole air of the car once every 80 seconds. Taking into consideration that the air must be heated in the cold months, to change the air 45 times an hour seemed a problem too difficult at present to attempt to solve, and the experiments were confined to an attempt to bring into the car only 1000 cubic feet per passenger per hour, which necessitated changing the air of the car only once in four minutes. The amount of air brought into the car was determined by determining the amount of carbon dioxide in the air of the car containing a given number of passengers, and taking the amount of carbon dioxide given off per person from breath and skin as 0.6 cubic foot per hour, and the normal amount of carbon dioxide in the air as four parts in 10,000. It was found possible by means of taking the air through two hoods at diagonally opposite corners of the car, thence through downtakes underneath the hoods to spaces, one on each side underneath the car floor, and from these spaces by means of proper apparatus, to pass the air up through the floor, over the heating system and finally out of the car through ventilators placed on the center line of the upper deck, to change the air of the car once in every four minutes, and at the same time to keep the car at a comfortable temperature even in severe winter weather. At the present time, July, 1904, the above system is in daily use on 800 cars on the Pennsylvania lines east of Pittsburg and Erie, and is also used in 200 cars on the Pennsylvania lines west of Pittsburg, and is applied to all new passenger cars being built. It has not as yet been tried with sleeping cars.

LEONARD P. KINNICUTT.

Bacterial Sewage Disposal at Ash, England. BY H. S. WATSON. *Eng. Record*, 50, 379–380.—Population, 14,000. Dry weather flow of sewage, 18,000 Imp. gallons. The plant is of especial interest as it was designed with reference to the treatment of brewery waste, as 60 per cent. of the sewage is brewery effluent. The plant consists of a scum tank, from which the sewage is discharged to three contact beds, from these beds to an equal number of second contact beds, from which it can be discharged to three third contact beds or to a specially prepared irrigation area. The scum tank is 51 feet 6 inches long, 24 feet 6 inches wide, having at one end a grit chamber 8 feet deep. The tank proper is 6 feet deep, sloping down to 7 feet 6 inches at the lower end, at which point a channel 1 foot 6 inches wide runs across the tank. The inlet and outlet each consist of a 12-inch pipe which dips 3 feet below the surface. The Adams automatic apparatus, controlled in this country by the Pacific Flush Tank Company, is used to admit the sewage from the scum tank to the three first contact beds, and to discharge the effluent from these beds. The three first contact beds are 52 feet 6 inches long, 24 feet 3 inches wide, sloping down from 3 feet to 4 feet across the width of the bed. They have each a liquid capacity of 8000 Imp.

gallons. The filling material consists of 6 inches of broken clinker, 2 feet of 1-inch clinker, topped off with 6 inches of 3-inch clinker. Along the full length of the lower side of the bed runs a channel 12 inches wide, sloping from 1 foot at the upper end to 6 inches in depth at the lower end covered with a cast-iron grating, forming the main drain for 3-inch drain pipes placed across the width of the bed, 2 feet 6 inches apart. The three second contact beds are 30 feet by 31 feet 6 inches, sloping from 3 feet 6 inches to 4 feet 6 inches in depth and the filling material consists of 3 feet 6 inches of ⅛-inch cinder. The drainage is the same as in the first contact beds. The three third contact beds are filled to the depth of 6 inches with brick rubbish and broken concrete, accumulated during construction work, in which are embedded rows of drain pipes, 4 feet apart, and with a layer of clinker dust 3 feet deep. The irrigation area was prepared by trenching it over to a depth of 12 inches below the surface and thoroughly mixing with this 12 inches of loose earth, 18 inches of coke, ¾ to 1-inch diameter, making 2 feet 9 inches of good filtering material. The time occupied from the discharge of the sewage into the "scum tank" till the effluent runs into the river is nine hours. Even with the above plant, a preliminary treatment of the brewery effluent to remove the large amount of hop seeds and yeast is considered necessary. This consists in passing it through one of two filters, each 18 feet 9 inches by 5 feet, by 5 feet 6 inches in depth at the shallow end, sloping to 6 feet in depth at the deeper end. The underdrainage consists of bricks laid on edge on which are placed pieces of slate. On these is laid a layer of coke averaging 1 foot 3 inches deep, the top being finished off with 6 inches of ½-inch coke, covered with a 3-inch layer of clinker ¼-inch and smaller, but containing no dust. These filters are worked alternately for three days each, during which time a layer of solid matter about 4 inches in depth collects, which is removed and sold for a fertilizer. As the sewers of Ash carry storm water, provision is made to manipulate the flow in such a manner as not to materially interfere with the operation of the plant. A manhole is placed in the main sewer just above the works and a weir is built in this manhole at one side, the level of which is the same as the high-water level in the tank. By this arrangement no storm water passes over the weir until at least two beds have been filled, and the liquid has again risen to the high-water level in the tank. LEONARD P. KINNICUTT.

Open Sand Filters for the Providence Water Works. (Illustrated.) *Eng. Record*, 50, 356–358.—A description with cuts of the slow sand filtration plant now being constructed at Providence, R. I. The water is to be taken from the Pawtuxet River and the plant is to consist of a low lift pumping station with intake screen chamber and coal vault, six uncovered filter-beds of 1 acre area each, a regulator house and the necessary conduits and drains. The plant will probably be completed in the autumn of 1905.

LEONARD P. KINNICUTT.

Copper Sulphate Treatment of Lakes Clifton and Montebello, Baltimore Water Works. BY ALFRED M. QUICK. *Eng. News*, **52**, 283–285.—These are two low-service storage reservoirs in the city of Baltimore. The storage capacity of Montebello is 500,000,000, of Clifton, 265,000,000 gallons, and about 50,000,000 gallons are run in and out of these reservoirs per day. Late last spring complaints were received that the ice made from this water had a greenish discoloration and that there was a perceptible odor from the water of one of the reservoirs. Analyses gave 69 algae and 480 bacteria per cubic centimeter in Clifton water and 44 algae, bacteria not determined, in Montebello water. Upon the advice of Dr. Moore and Mr. Kellerman both lakes were treated with copper sulphate. For Lake Clifton 300 pounds of copper sulphate was used or about one part to 6,390,000 parts by weight. For Lake Montebello 600 pounds one part to 6,685,800. The method of application was by placing the salt in bags, about 75 pounds in each and attaching one at a time to the stern of a row boat and rowing the boat around the lake in concentric courses, about 40 feet apart. Analyses of the waters indicated a great reduction in the algae in forty-eight hours, and with Lake Clifton water practically complete elimination at the end of one hundred and twenty hours. With Montebello water there was a slight increase after forty-eight hours, until the eighth day, when the number dropped to 14. On account of rain falling in the reservoirs the bacteriological analyses gave no correct indication of the action of the sulphate on the bacteria. Chemical analyses showed no trace of copper in the water five days after application of the sulphate. Five weeks after the application, analyses were again made of the water and showed about the same number of algae as before the application was made. All the analyses were submitted to Dr. Moore and in his report in regard to the experiment he states: "It seems to me that the treatment has been as satisfactory as could possibly be expected. The organisms which now are present in the reservoir are among those which have shown themselves particularly resistant to the copper treatment, and I doubt if any of them will increase sufficiently to cause any trouble." "The only sample of Baltimore water which I have seen was the one Mr. Kellerman obtained from Lake Clifton, and this at the time of treatment must have contained 700 or 800 filaments of *Anabaena cincinalis*. I think this was undoubtedly the organism which was causing trouble at the time, and as there seems to be no trace of it at present in the water, it must have been thoroughly eradicated, as the weather we have had recently is calculated to make it increase very rapidly."

LEONARD P. KINNICUTT.

The Purification of Water. BY JOHN M. ORDWAY. *Journal Ass. Eng. Soc.* 33, 12–20.—Bacteria can be removed by sand filtration or by filtering the water through a soft porous earthenware filter. Color can be more easily removed by the use of the highly basic aluminum chloride than by the ordinary sulphate; especially is this true with brownish waters. Iron, when not obstinately held in solution by organic matter, can be removed by forcing air through the water, or by a much-retarded dropping of the water through air : the addition of a little lime or soda is needed, if the iron is present in the form of ferrous sulphate. Hardness, if caused by calcium or magnesium carbonates, can be best reduced by use of milk of lime; if caused by calcium sulphate, by use of sodium carbonate. Trisodium orthophosphate works better than the carbonate, but is more expensive. As a preventative for boiler incrustation, the only substances that are rationally advantageous are sodium hydroxide and calcium hydroxide in the form of milk of lime, for waters charged with earthy carbonates, sodium carbonate for those containing sulphates and chlorides, and trisodium orthophosphate for such as are turbid. They should be used so as to take out the obnoxious substances before the water goes to the boilers. LEONARD P. KINNICUTT.

INDUSTRIAL CHEMISTRY.

Spontaneous Ignition of Coal. BY ALFRED O. DRAKE. *Eng. News*, August 18, 1904.—Points not previously given in the abstracts of this Review includes:

The protecting of iron work in contact with coal by means of cement to prevent corrosion ; the coal should not be allowed to heat, as determined by test rods run into the heart of piles, to above 140° F. ; the reason why quenching with water is often not successful is because of the coking around the burning center ; the best method is to run a pointed two-inch pipe, with its lower 3 or 4 feet perforated with ⅜-inch holes, down to the location of the fire, as indicated with the test rod, and water is then forced into the heart of the fire. S. P. SADTLER.

Aluminum Conductors. BY RODERICK J. PARKER. *Eng. Min. J.*, p. 357, Sept. 1, 1904.—As compared with copper, the cost of transportation and erection of aluminum conductors is less, with greater durability and less cost of maintenance. The chief disadvantages are the difficulty of making joints, great sag, due to the large coëfficient of expansion and insufficient strength of wires for small currents.

The following table shows the relative figures for the two metals, commercial aluminum and commercial hard drawn copper:

	Aluminum.	Copper.
Specific gravity	2.68	8.93
Conductivity	62.00	97.00
Tensile strength (per sq. in.)	28,000	45,000
Cross section for equal resistance	1.56	1
Diameter of equal resistance	1.25	1
Weight of equal resistance	0.47	1
Tensile strength for equal resistance	0.76	1
Price for equal weight	2.13	1

Soldering can be done, but unsoldered joints are preferable.
S. P. SADTLER.

Types of Oil Burners. From Report of the United States Naval Liquid Fuel Board. *Iron Age*, September, 1904.—No matter what the type of burner, clogging is bound to take place even when the oil is pre-heated and strained, and therefore, burners should be easily cleaned and have all parts renewable.

The board found that too few burners were usually installed to insure regularity of service and recommended the use of extra burners.

Oil should be injected into the centers of fire chambers and not against surfaces to be heated.

Five classes of oil burners are referred to:

1. Drooling burner; 2. Atomizer burner; 3. Chamber burner; 4. Injector burner; 5 Projector burner.

The *Drooling Burner* consists of two tubes, one over the other, the upper one, containing the oil, allows the oil to drip on the steam jet, which thoroughly mixes with the oil as it expands.

The *Atomizer Burner* is similar to the above except that the steam jet crosses the orifice of the oil tube at about a right angle.

The *Chamber Burner* provides for a mixing of the oil and steam as the name indicates.

The *Injector Burner* is made up of concentric chambers. In this way the oil is drawn out by the steam and injected with considerable force into the fire-box.

The *Projector Burner* is similar to No. 2, except that the steam orifice is at some distance from the oil and collects air to aid in the atomizing of the oil.
S. P. SADTLER.

Some Notes on the Uses of Electrolytic Chlorine. BY F. WINTELLER, PH.D. *Electrochemical Industry*, September, 1904.—In addition to the manufacture of bleaching-powder, which has been gone into in so many places because of the ease with which it is made, thus leading to an overproduction, the author discusses other means of utilizing electrolytic chlorine as well as outlines the manufacture of bleaching-powder.

The best arrangement of cells and absorbent chambers for the manufacture of bleaching-powder is to have the cells located on the second floor of the building, and the absorbent chambers on the first floor. In this way the chlorine gas will draw in air rather than escape into the room, if there is a leak in the apparatus, and the air mixed with chlorine is not detrimental to the manufacture of chloride of lime, in fact is advantageous. Chloride of lime, thus produced, will contain 36 per cent. of active chlorine, if the following conditions are observed:

The chlorine should be as dry as possible.

The calcium hydroxide should be as dry as possible.

The temperature of the reaction should not exceed 35° C.

This is accomplished by allowing the chlorine to draw in about 50 per cent. of air before entering the calcium hydroxide chambers. An excess of chlorine in the absorbing chambers should be avoided, as there is a tendency to form chlorate by an excess.

Detinning of Tinned Iron Scrap.—The well-dried chlorine is passed at the temperature of 40° to 50° C., over the scrap which changes the tin into liquid fuming tin tetrachloride, $SnCl_4$. The so-called "pink salt" or double chloride of ammonium and tin may be formed from this.

Iron chloride is not formed by the action of chlorine upon iron, at the temperature of this operation. The iron left after this action is quite pure and is melted into pigs or bars.

Chloride of Sulphur.—This is obtained by the action of electrolytic chlorine on sulphur dichloride, S_2Cl_2. It is also made by passing the chlorine through melted sulphur.

SO_2Cl_2 or sulphur oxychloride is also made by bringing together sulphurous acid and chlorine in a vessel containing 50 grams of camphor. The vessel is intially heated but afterwards the operation is conducted with slight cooling. The SO_2Cl_2 is distilled over at 77° C.

Chloride of Phosphorus.—Phosphorus trichloride and phosphorus pentachloride are made by passing dry chlorine gas over phosphorus.

Peroxide of Lead.—This is formed by the action of a solution of chloride of lime on finely powdered acetate of lead. The mixture is boiled and lead peroxide separates out. It is purified by washing and filtering.

Among the organic compounds formed by the use of electrolytic chlorine, acetic anhydride, chloroform, chloral, dichloracetic acid, methylene chloride, monochloracetic acid, trichloracetic acid, ethylene chloride, monochlorbenzene, paradichlorbenzene, paradichloraniline, benzalchloride and metachlorbenzaldehyde are mentioned by the author. S. P. SADTLER.

Sulphuric Acid by the Contact Process. *Electrochemical Industry*, September, 1904.—This article opens with the suggestion that probably the better knowledge of the constitution of matter, which is now being gained, will shed more light on this mysterious chemical or possibly electrochemical property, *catalysis*, which enables reactions to take place without the apparent alteration of some one or more substances necessary for the reaction. The best known catalytic agent is finely divided platinum.

With regard to the explanation of this phenomena, it seems reasonable to believe that with the case of platinum in the sulphuric acid process the action is one of occlusion of gases by the platinum. Another theory as to the action of the platinum is that heat is concentrated upon it from the surrounding space.

"There are several good reasons for believing that the compound formed by burning sulphur would be sulphur trioxide if the part played by the external conditions was nil. For instance, a very considerable amount of sulphuric anhydride is invariably found in ordinary "burner gas," and by carefully avoiding an undue rise of temperature in the kilns, the proportion of sulphuric anhydride can be greatly increased. Also, the heat of formation of sulphuric anhydride being in excess of that of sulphur dioxide is an indication in favor of the production of sulphuric anhydride when the reacting elements are allowed free play. But sulphuric anhydride is dissociated at a comparatively low temperature (below 700° C.), and the heat evolved in its formation is great (22,000 cal.). In consequence, therefore, sulphur dioxide predominates in the gaseous mixture formed by the combustion of sulphur or pyrites. This predomination does not obtain, however, after the burner gases, properly purified, have been passed through platinum-bearing material, and thus has arisen the assumption that the function of the platinum is to destroy the sensible heat, and to maintain the temperature below the decomposition point of sulphuric anhydride. Here, also, a limit to the catalytic power of platinum is indicated, if the heat evolved is supposed to be simply conducted away, and it scarcely seems probable that, if this heat energy were converted into thermo-electric energy, as has also been suggested, such action would have escaped detection by one of the many investigators of the subject. Fortunately, however, our inability to follow every move of the molecules, when in the neighborhood of finely divided platinum at the right temperature, does not prevent us from controlling its course through a comparatively simple apparatus, and with drawing therefrom a new and more valuable substance."

Sir Humphry Davy observed the catalytic action of platinum in 1818, but no practical results were obtained for about fifty years, although Phillips, of Bristol, England, patented a process for manufacturing sulphuric anhydride by catalysis in 1830.

The researches of Winkler published in 1875, combined with the increased demand for high strength acids, are responsible for the position of the industry to-day.

Winkler was engaged with the production of the so-called Nordhausen sulphuric acid from copperas, by the decomposition of which sulphur dioxide and oxygen were obtained in stoïchiometrical quantities, a condition Winkler believed necessary for profitable operation.

Experience has shown that the most economical procedure in operating either a contact or chamber sulphuric acid plant, considering both roasting and the "acid" departments, is to produce gas of the following composition.

	Per cent.
Sulphur dioxide	7
Oxygen	10
Nitrogen	83

As soon as the gas has left the kiln room radical departures from the older practice are encountered. Instead of eliminating the impurities, arsenic, antimony, selenium, tellurium, iron, nitrogen compounds, etc., subsequent to the withdrawal of the acid from the chambers, the contact process necessitates the actual chemical elimination of everything except sulphur dioxide, oxygen and nitrogen before the gas is admitted to the contact compartments, thus necessitating purity of the reacting substances as one of the initial stages of the process.

Arsenic was found to be the chief source of difficulty in this purification, as it is very hard to deposit from the combustion gases. To remove the difficulty of arsenic, therefore, it was found necessary to prevent the condensation of the sulphuric acid upon the iron flues and to effect a supplementary oxidation of the gases in order to break the union between the arsenic and sulphur. This is accomplished by means of a jet of steam.

The mechanical impurities carried along by the current of gas, such as iron oxide and zinc oxide, can be isolated by dust chambers and scrubbing towers.

"The first successful application of this principle was that of R. Knietsch, assignor to the Badische Anilin and Soda Fabrik of Ludwigshafen, Germany (United States patent 688,020). Other inventors have subsequently employed the thermochemical effects of the reaction with a similar result, but their method of procedure has, of necessity, differed materially from that of Knietsch. The plants operating under the patents of Knietsch, Max Schroeder (controlled in the United States by the New Jersey Zinc Co., United States patent 742,502) and Herreshoff (controlled by the General Chemical Co., United States patents 719,332 and 719,333) produce by far the greater amount of acid made by the contact method. It will therefore be interesting to note briefly how in these three cases infringement has been obviated in the matter of "regenerating cooling."

The Knietsch apparatus consists of a well-insulated vessel of iron or masonry, provided with ingress and egress passages. The comparatively cool sulphurous acid from the purifying apparatus travels upward completely surrounding a number of iron tubes containing the active substances through which the descending current is forced to pass in the opposite direction before leaving the apparatus.

"Schroeder brings the purified sulphur gas to the required temperature by passing it through conduits placed in the kilns or by means of a heater adjacent to the kilns, thus employing the heat of burning pyrites or sulphur instead of that developed by the oxidation of sulphur dioxide."

"Herreshoff makes use of the heat liberated in the contact chambers, but his method differs from that of Knietsch in that he effects a transfer of heat in a separate specially constructed apparatus external to the contact mass. Therefore, the gas before entering the converting pots, of which there are two, travels through two separate vessels simultaneously and in close proximity to a counter current of the highly heated sulphuric anhydride leaving the contact pots."

In this apparatus the control of the temperature of the platinized material cannot be effected except by varying the amount of sulphur dioxide.

W. C. Ferguson, of the General Chemical Company, patented an apparatus consisting of a "plurality of contact chambers," of such dimensions that the sulphur dioxide is not wholly oxidized in the first one, and he further provides means for introducing a regulable supply of oxygen or air into the stream of gas passing from one contact pot to the next.

In the apparatus of Herreshoff the platinized asbestos is placed on perforated plates arranged one above the other about an inch apart, instead of in tubes.

It is a surprising fact that water, even under most favorable conditions, fails to unite except to a slight degree with the sulphuric anhydride contained in the gases issuing from the converter, and even caustic soda or barium hydroxide solution allows the sulphuric anhydride to pass through with only slight absorption.

In the presence, however, of a large amount of sulphuric acid, the anhydride is completely absorbed. For this reason strong sulphuric acid of 96 per cent. and over is generally used as the absorbing agent.

With regard to the various contact materials, platinized asbestos has been found to be most suitable. The fiber is saturated with platinum chloride solution together with the reducing agent such as oxalic acid. The mass is then heated to drive off hydrochloric acid while the platinum is left deposited on the asbestos in a fine state of division.

Other contact agents suggested are freshly prepared ferric oxide, anhydrous copper sulphate, copper oxide and chromic oxide.

"The recent improvement effected in the chamber process is a remarkable instance of response to threatened competition by an old-established and most conservative industry. A few years back 20 cubic feet of chamber space and 0.025 pound of niter per pound sulphur burned was considered fair practice. At the present time, in up-to-date plants these figures must be changed to 10 or 12 cubic feet and 0.015 pound niter. Improved construction of the towers, the use of fans to insure uniformity of operation regardless of atmospheric conditions, and to thoroughly mix the gases, and running nitric acid down the Glover tower, instead of 'potting' niter, have been the chief contributors to this result.

In the concentrating department Kessler stills have brought down the cost of producing 66° Bé. and 66½° Bé. acid.

In regard to first cost, a chamber plant is probably somewhat less expensive to erect, but occupies many times the space required by a contact plant, and entails a very much greater repair bill.

If, however, stills be included, there is no doubt a handsome balance in favor of the new process.

Some idea of the magnitude of the sulphuric acid industry can be obtained from the following figures taken from the census report of 1900 :

No. of establishments (all Chamber)	127.	
50° acid produced,	1,906,878,903	pounds.
60° " "	34,023,131	"
66° " "	754,558,455	"
Brimstone burned,	673,076,695	"
Value of acid,	$14,247,185.	

S. P. SADTLER.

PATENTS.

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758,658. Charles Jacobs, New York, N. Y. Compound for **coating bricks,** etc. Equal parts of caustic soda, nitric acid, muriatic acid, tartaric acid, sugar of lead and 16 parts of varnish or oil, a linseed oil.

758,687. Alexander S. Ramage, Cleveland, Ohio. **Ferric pigment.** A ferrous sulphate liquor is concentrated and blown with air to precipitate basic ferric sulphate, then diluted and again blown to precipitate basic ferric hydroxide on the sulphate, and the acid neutralized.

758,710. Howard Spence, Manchester, England. Assignor to Peter Spence and Sons, same place. **Titanous sodium sulphate.** Titanium sulphate is reduced by electrolysis in the presence of sodium sulphate and sulphuric acid, and the solution evaporated. The salt is of a lilac color, is easily soluble in water and is a powerful reducing agent.

758,774. Guido Pauling, Olbernhau, Germany. Making **nitric dioxide and nitric acid.** A mixture of air and steam is heated to the dissociating point of water, the mixed gases passed through an incandescent tube through the walls of which the hydrogen escapes and chlorine is combined with it to form hydrochloric acid, the nitrogen compounds being collected and condensed.

758,775. Harry Pauling, Gelsenkirchen, Germany. Apparatus for **treating gases.** A fan or other forcing device is connected with a funnel-shaped electrode through which the gases are forced, while within the funnel a revolving shaft electrode is placed.

758,799. Orin A. Trowbridge, Columbus, Wis. Assignor to Creamery Package Manufacturing Co., Chicago, Ill. **Testing device.** A flask has a long straight neck, graduated, and in this neck is placed a loosely fitting rod with a handle for convenience of insertion, the liquid is placed in the flask at zero on the scale, and rises to a definite height on insertion of the rod, according to its specific gravity.

758,844. George Lunge, Zurich, Switzerland, and George P. Pollitt, Stanford le Hope, England. Assignors to Verein Chemischer Fabrik, Mannheim, Germany. Making **sulphuric anhydride.** The process of making sulphuric anhydride which consists in passing gases derived from ore roasting over a contact substance consisting of ferric oxide and 5 per cent. or more of arsenic in all its parts.

758,853. Thomas Rouse, Stamford Hill, England. Assignor one-half to Herrmann Cohn, London, England. Making **briquets from iron sand.** Powdered iron or blue billy is agglomerated by water glass, and dried in a ventilated chamber by hot air and steam.

758,874. Clark M. Terrell and Oliver C. Terrell, Grants Pass, Oregon. Treating **pine needles.** The needles are steamed to liberate oil and get the extract, then crushed for fiber, sifted, washed, wrung and dried.

758,882. Walter R. Addicks, Brookline, Mass. **Carburetted water gas.** The apparatus comprises three upright cylinders, being a generator, a carburetter and a fixing chamber, and connecting pipes.

758,883-4. James N. Alsop, Owensboro, Ky. Making **gas and apparatus therefor.** Arc lights are short-circuited in an air mixture, and the arc re-established, whereby nitrogen compounds and ozone are made and used for bleaching flour. The second is for the apparatus, a large chamber, on top of which is a walking beam to the ends of which the electrodes are attached, alternately making and breaking the arc.

758,936. Wm. Sanders, North Birmingham, Ala. Assignor to Wm. J. Ryan, Birmingham, Ala. **Compound for coating eggs.** Water 12, gum acacia 3, lime and zinc oxide each 1 part by weight.

758,944. Wm. B. Tyler, Camden, N. J. **Polishing compound.** Headlight oil, hard oil finish, petroleum soapsuds, equal parts, and photograph paste a little. Petroleum soapsuds is made from petroleum soap.

758,945. As above, for **cleaning pictures.** The picture is soaked in petroleum soapsuds, next coated front and back with the mixture of the above patent, then immersed in strong suds covvered with headlight oil, and dried and polished.

758,949. Wm. S. Apple and Harry K. Mundorf, Philadelphia, Pa. Device for **administering serums.** A graduated tube adapted to contain the serum is drawn out at each extremity, having first placed in one end a plunger fitting the tube ; it is then sterilized and filled with serum and the ends sealed. For use, both ends are broken, a glass handle fitting the plunger is inserted in one end and a hypodermic needle put on the other, it is then ready for use.

759,008. Francis J. Oakes, New York, N. Y. **Glucoside dye.** Logwood is leached in a bath containing carbon dioxide, forming haematoxylon carbonate, a red-brown crystalline powder, soluble in water, not reducing metallic oxides in alkaline bath, but oxidizing to hematin carbonate on exposure to air.

759,103. Judson K. Heikes, St. Louis, Mo. **Detergent compound.** Linseed oil 3, coal oil 104, light mineral oil 5, olive oil 2, oil of sassafras 8, oleum citronella, alkanet root, and cottonseed oil 4 parts each.

759,191-2. Charles H. Rider, St. Louis, Mo. Treating **copper ores,** the last for lead ores. A series of receptacles with U-shaped connecting pipes at the top are filled with crushed ore, a solvent of sodium chloride, nitric acid and water is added to the first vessel and the gases are forced in succession through all the first series of vessels and into a second series that at first has water in them, which is removed and its place taken by the liquor from the first series to precipitate the metal by iron. In the second patent, sodium bicarbonate is used as the precipitant.

759,208. Paul Bachmann, Cologne, Germany. Making an **insecticide.** Naphthol is dissolved in formalin and heated with a liquid potash soap which produces a dihydroxynaphthylmethane preparation.

759,220. Lewis E. Porter, Los Angeles, Cal. Assignor one-half to John J. Seeman, Barstow, Cal. Treating **copper ores.** The ore is dissolved in an alkaline cyanide solution, the copper precipitated by acid, and the solution treated with an alkaline oxide to reproduce the alkaline cyanide, the copper precipitate being purified by an electrolysis in an alkaline solution.

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759,284. Karl Jagerspacher and Thilo Krober, Basle, Switzerland. Assignors to Society of Chemical Industry, same place. **Blue azo dye.** An acidyl-*p*-diaminophenol ether is diazotized and combined with a peridihydroxynaphthalene sulphonic acid, and the acidyl aminoazo dye saponified. A bronze powder soluble in water blue turning red on adding soda-lye, and red-violet with acetic acid, precipitated from its aqueous solution by a mineral acid in brown-red flakes.

759,301. Helen J. McKeel, Chicago, Ill. Composition for **transferring pictures.** A soap solution is made from castile soap, and turpentine added (about one-fifth part).

759,332. Charles N. Waite, Lansdowne, Pa. Assignor to General Artificial Silk Co., of Delaware. **Artificial silk.** The filaments steamed under tension in the presence of sulphurous acid, whereby sulphur and caustic soda are removed.

759,387. Marius Magnard, Salaise, France. **Pyrotechnic compound.** A mixture of 5 kg. each of water, gum arabic, and magnesium carbonate are heated to 50° C., 1 kilo white phosphorus added with stirring, cooled to 25° C., 2.5 kilos red ochre added with 3 kilos potassium chlorate, and the mixture ground.

759,406. Albert Tissier, Paris, France. **Gas-condensing bodies.** A quartzite of 78.8 silica, 6.96 alumina, 4.32 magnesia and 1.44 iron is powdered, water added, pressed and baked at 2000° C. for porous shapes.

759,424. Asahel K. Eaton, New York, N. Y. Making **metallic chromium.** One-half assigned to Hugh M. Eaton, same place. Zinc chromite and animal charcoal are powdered and briquetted, then heated to volatilize the zinc and reduce the chromium.

759,443. Edward J. Hoffman, Chicago, Ill. Assignor to National Compressed Coal Co., of Delaware. **Binder for briquettes.** Oil of mirbane (1 per cent.) is mixed with 66 per cent. of crude petroleum to deodorize it, and rosin, soda-ash and lime (11 parts each) added.

759,493. Isaac Anderson, Prescott, Ariz. Assignor one-half to Michael Scanlan, Whitehills, Ariz. **Recovering metals.** Solutions containing gold, silver, iron and copper are treated with lime, with agitation, to obtain the gold and silver.

759,526. William W. Hout, Cortland, N. Y. **Welding flux.** Calcined borax 15, iron filings 30, furnace dross slag or cinder 40, and calcined marble dust 15 parts.

759,590. Walter M. Brown and Dexter Reynolds, Albany,

N. Y. Making **iron direct from the ore.** Iron oxide and carbonaceous material are granulated and mixed, the carbon being just enough to reduce the iron and make steel of the desired quality, heating the mixture from waste products of combustion, adding flux sufficient to remove impurities, while excluding the atmosphere till fusion occurs.

759,613. Karl Jedlicka, Basle, Switzerland. Assignor to the Society of Chemical Industry, same place. **Violet tetrazo dye.** One molecule of the tetrazotized paradiamine of the diphenyl series is united with 2 molecules of naphtholic compounds, one being 2-5-1-7-aminonaphthol disulphonic acid. Two molecules of this acid may be used. A dark powder of bronze luster, soluble in water violet, in concentrated sulphuric acid blue, insoluble in hot alcohol, dyeing unmordanted cotton violet, that by further diazotation and use of β-naphthol gives a fast indigo-blue.

759,617. Stephen Kneppel, Scranton, Pa. **Alloy.** Aluminum 6, zinc 1, and Babbit metal 2 parts by weight, the Babbit metal being tin 96, antimony 8, and copper 4 parts by weight.

759,651. James N. Alsop, Owensboro, Ky. Treating **flour.** Air is ionized by an electric arc to make nitrogen-oxygen combinations, and the mixture is applied to flour so as to convert part of the starch into proteids.

759,657. August Bischler, Basle, Switzerland. Assignor to Basle Chemical Works, same place. **Red basic rhodamine dye.** Rhodamine bases are heated with halogenized fatty acids, as chloracetamide. A green-red crystalline powder, soluble in water red and fluorescent, and developing ammonia on heating with soda-lye.

759,670. Ernest P. Clark, New York, N. Y. Assignor one-half to Edward Baltzley, Glen Echo, Md. **Reduction of copper ores.** The ore is first leached with dilute sulphuric acid and iron sulphate, the insoluble portions are oxidized and again leached,

759,716. Paul Julius, Ludwigshafen-on-Rhine, and Siegfried Haeckel, Mannheim. Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen. **Red azo dye.** Diazotized *o*-chlor-*p*-toluidinesulpho acid is combined with *b*-naphthol; its sodium salt is difficultly soluble in hot water, its barium, calcium, aluminum or lead salt is an insoluble scarlet-red powder.

759,783. Thomas Weeple, Oakland, N. J. **Smokeless fuel.** Soft coal is boiled in water and then dried.

759,800. Henry F. Bockmeyer, Philadelphia, Pa. Assignor to A. O. Granger, Cartersville, Ga. Treating **cottonseed hulls or cotton waste.** The material is first steamed in a one or two per cent. alkali solution, washed, a one per cent. alkali solution added and chlorine gas passed through it with agitation, the liquid separated, the material washed and the chlorine neutralized.

759,808. Louis A. Dreyfus, New Brighton, N. Y. Treating **casein.** Dry acid casein is heated in the presence of sulphuric acid. A mineral base may be added.

759,831. Claude A. O. Rosell, New York, N. Y. **Chrome tanning bath.** Chrome alum, a thiosulphate, and a sulphite.

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759,887. Friedrich Hinz, Berlin, Germany. **Making peroxides.** An electrolyzer with porous diaphragm has the anode compartment charged with magnesium chloride, and the cathode with the same solution and hydrogen peroxide added, the current passed, depositing magnesium peroxide on the cathode, it drops off, is collected and dried.

759,938. Wm. B. Taylor, Winter Park, Florida. **Preserving wood.** Glue or plaster of Paris and tar two each, and resin five parts by weight.

759,978. Leon Feval, Newark, N. J. Assignor to Transparent Cellulose Products Co., Newark, N. J. Making **tubular articles.** A non-collapsible former is coated with a 60 per cent. solution of sodium silicate, then dipped in a solution of pyroxylin and dried, whereby the first coat contracts so that the pyroxylin article can be removed.

760,018. Rudolph Reiss, Charlottenburg, and Otto Schmatolla, Berlin, Germany. **Medicated soap.** A fatty acid and a hydrocarbon are mixed and a lye of fixed alkali less than required for saturation added, the whole heated till all water is driven off and a medicinal substance as salicylic acid added.

760,057. Alfred H. Cowles, Cleveland, O. Making **calcium carbide.** A calcium compound and carbon are charged into an electric furnace having a conducting casing, an electric current of increasing density is passed, thereby melting the carbide produced, cooling the outer face of the casing and decreasing the conductivity of the charge adjacent to the casing, and removing the carbide and supplying fresh material.

760,110. Wilhelm Emmerich, Hochst-on-Main, Germany. Assignor to Meister, Lucius und Bruning, same place. **Orange sulphur dye.** Toluylene diurea is heated with sulphur, forming a dark red-brown powder, soluble in hot caustic lye and sodium sulphide solution brown; on evaporating the latter, a form soluble in water is obtained.

760,173. Augustus W. Ball, Richmond, Va. **Preserving meat.** An electric current is passed through the meat while immersed in a preservative solution and attached to the negative pole, the food being surrounded by the bath and forming the cathode and receiving the whole current.

760,183. Lawson Chase, Philadelphia, Pa. **Artificial stone.** Broken stone 90, rosin 10, and copper sulphate 0.25 per cent. are heated separately and fed into a mixer, the completed material issuing from the mixer so long as raw material is supplied.

760,185. Carleton Ellis, Boston, Mass. Assignor to George M. Port, same place. **Composition for leather dressing.** Zinc-aluminum palmitate 5, linseed oil 5, Chinese wood oil 5, gilsonite 4, and turpentine 20 parts by weight.

760,312. Alfred H. Cowles, Cleveland, O. **Calcium carbide.** A resistance conductor is made incandescent by an electric current, thus heating the carbide-forming materials piled around it to incandescence, tapping out the superheated molten carbide and supplying fresh material.

760,317. Wm. Kennedy Laurie Dickson, London, England. **Incandescent mantle.** The mantle is perforated where it is likely to be ruptured and the edges of the openings coated with pipe clay and sodium silicate.

760,319. Carl Dreher, Freiberg, Germany. Making **compounds of lactic and titanic acids.** Titanic acid is dissolved in hydrochloric acid, and an alkaline lactate added, the metal uniting with the solvent acid and the proportions making a hydroscopic mixture of 1 molecule titanic to 4 of lactic acids.

760,397. Edward C. Kirk, Lansdowne, Pa. Assignor one-half to Wm. J. Evans and Eustace H. Gane, New York, N. Y. **Dentifrice.** Calcium dioxide 2, powdered chalk 95, and a saponaceous substance as castile soap, 3 parts.

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760,539. Wm. J. Jory and Joseph H. Jory, San Francisco, Cal. **Recovering metals.** The ores of noble metals are treated with a mixture of alkaline sulphides and hydroxides while being pulverized, and the metals recovered by electrolysis.

760,541. Carl Ludwig, Schoenberg, Germany. **Shellac substitute.** Nine parts pure potassium hydroxide are boiled with 150 parts water and 56 parts resin with 1 or 2 parts oleic acid added, the mixture decomposed by dilute sulphuric acid and the precipitate washed and dried.

760,554. Myagoro Onda, Nagoya, Japan. **Alloys and sulphides of aluminum.** Aluminum oxide, which may be bauxite, carbon and a metallic sulphide, as iron sulphide, are fused in a suitable furnace at a high temperature, giving an alumino-ferric alloy.

760,561. Heinrich P. R. L. Porscke and Gustav A. Wedekind, Hamburg, Germany, **Battery electrodes.** A metallic oxide or the metal in powder is made into a paste with an aqueous solution of its own chloride ; this is molded, dried and reduced in an alkaline solution, then oxidized by heat or electrolysis.

760,563. Carl Reim, Odessa, Russia. **Alkaline silicates.** Solutions of alkaline silicates are dropped or sprayed on a moving heated surface, and removed the instant it changes from a liquid to a solid, whereby a moist soluble silicate is obtained.

760,571. Wilhelm Schwarz, Zurich, Switzerland. Assignor to Schwarz System Brick Co., New York, N. Y. Making **calcareous sandstone.** Quartz sand is heated nearly to melting in an electric furnace, lime added and the plastic mass molded in shapes.

760,585. John E. Thornton and Charles F. S. Rothewell, Manchester, England. **Positive photographic stripping film.** A dark-colored paper base is coated with a solution of a salt of a fatty acid, dried, a reinforce of zinc oleate added, the sensitive emulsion spread on this and a cover of dark paper put over all.

760,783. Carleton Ellis, Boston, Mass. Assignor to Nathaniel L. Foster, Trustee, Brookline, Mass. **Aluminum solder flux.** Silver bromide 10, sodium fluoride 9, melted wax 25 parts.

760,852. James Dewar, Cambridge, England. **Nickel carbonyl.** Carbon dioxide is passed over heated metallic nickel under a pressure above two atmospheres and below 100 atmospheres.

760,939. Stonewall J. Vance, Mountain Grove, Mo. Making **alcohol.** Ground grain is mixed with water and 3 gallons of ammonia to each hundred bushels, boiled, cooled to 150° F., malt added and fermented and distilled in the usual manner.

760,997. James A. Kendall, Streatham, London, England. Assignor one-half to Joseph W. Swan, Holland Park, London, England. Apparatus for making **cyanides.** A jacketed nickel retort has projecting front end and external tube fused on so that the joint is protected by hydrogen which is supplied to the jacket space, and supply vessels for the materials, the caustic alkali vessel having a nickel flow tube autogenously soldered in the retort.

761,007. Paul E. Oberreit, Ludwigshafen-on-Rhine, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Chlorinated indigo.** Cyanmethyl anthranilic acid is acted on successively with chlorine, caustic alkali, acetic anhydride, caustic alkali and air. Easily soluble in cold glacial acetic acid, and monohydric sulphuric acid, the latter solution green. but dyeing cotton from the vat blue.

761,044. Virgil M. George, Youngstown, O. **Purifying water.** A current of electricity is passed through the water under pressure, the electrodes being of different metals, the water then filtered through carbon, passed into a separator, and subjected to ozone.

WILLIAM H. SEAMAN.

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[R preceding a number or numbers refers to the Review of American Chemical Research. Pr refers to the Proceedings.]